



Intel[®] Integrated RAID Software

Software Installation and User's Guide, Version 1.2.3

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Introduction

1

Intended Audience

This documentation is intended for users who are experienced in configuring computer systems with new add-in cards or have had previous experience with Intel® Integrated RAID (IIR) controllers.

Read and adhere to all warnings, cautions, and notices in this guide and the other documents in the user documentation set supplied with this product.

1.1 Using the User Documentation Set

User documentation for this product is provided in four separate documents:

Installation Quick Start Poster

The *Installation Quick Start Poster*, or *Quick Start Poster*, provides a high level view of installing and configuring a RAID controller. Refer to the accompanying *Software Guide* for more detailed information.

Hardware Installation and User's Guide

The *Hardware Installation and User's Guide*, or *Hardware Guide*, covers instructions for installing an IIR controller and provides a guide to its features and specifications. For a particular IIR controller, its hardware guide documents compatible RAID adapters, supported operating systems, standard features and optional features.

Software Installation and User's Guide

The *Software Installation and User's Guide*, or *Software Guide*, contains:

- Quick installation of the IIR controller software on a newly created bootable host drive with commonly used operating systems.
- Detailed instructions covering more complex software installation scenarios for all supported operating systems.
- Instructions for using the RAID Software Suite, the drivers, tools and utilities of the IIR controller.

The first part of the software guide provides an overview of RAID technology and its features. Next, the guide documents various installation procedures for an IIR controller and the RAID Software Suite, depending on the chosen OS configuration. The software guide then includes descriptions of the utilities, Storage Console (StorCon) and Storage Console Plus (StorCon+), to facilitate the configuration of the RAID subsystem. Finally, the guide provides details of all product features supported by the software and firmware. For further information refer to the Optional Features section of the appropriate hardware guide since not all features are applicable to all IIR controllers.



Clustering Guide

Clustering is applicable only for those RAID controllers that support this feature. See the Hardware Guide to determine if clustering is supported.

The Intel® Integrated RAID *Controller Clustering Guide*, or *Clustering Guide*, describes how to set up clustering configurations using IIR Controllers and IIR controller software.

Information on Operating Systems, Cluster functionality, and other system details may be found in their corresponding system manuals.

1.1.1 Document Formats

All documents, with the exception of the quick start poster, are provided on the CD-ROM in both PDF and HTML format:

- **HTML**—To view online HTML documents, Click Documentation from the autorun menu or open <cdromdrive>:\docs\index.htm.
- **PDF**—Portable Document Format (PDF) documents can be opened, viewed, and printed with Adobe* Acrobat Reader* (not provided on the CD-ROM).

1.2 About This Guide

This guide covers two major topics:

- The software installation for the IIR controller.
- All implemented features of the IIR controller, including optional and advanced features.

Note: Refer to the Hardware Guide of the specific IIR controller to determine which implemented features are applicable.

This Software Guide provides installation instructions for the following operating systems:

- Microsoft* Windows* 2000
- Microsoft Windows NT*
- Linux*
- Novell* NetWare*
- SCO* UnixWare*
- SCO OpenServer*
- Berkeley UNIX* FreeBSD*

Note: Refer to the Hardware Guide of the specific IIR controller to determine the supported operating systems and OS versions.

Caution: Ensure that your computer system/platform also supports your required Operating System before attempting to install and configure your IIR controller.

1.2.1 Installation Guide

The portions of this manual dedicated to the installation guide contain the following:

Chapter 1, Introduction

This chapter describes the user documentation set, RAID levels and levels of drive hierarchy.

Chapter 2, Getting Started

This chapter provides instructions for creating an IIR controller installation diskette.

Chapter 3, Quick Installation

This chapter covers the quick installation of the IIR controller software on a newly created bootable host drive with the following operating systems:

- Microsoft Windows 2000
- Microsoft Windows NT 4.0
- Novell NetWare 4.2x, 5.x and 6.x
- UnixWare 7.1.1 and 8.0

Refer to [Chapter 4](#), [Chapter 6](#) and [Chapter 7](#) for more complex installations on these same operating systems. Refer to [Chapter 5](#), [Chapter 8](#) and [Chapter 9](#) for installations with other operating systems.

Chapter 4, Installing Microsoft Windows 2000, Windows XP Professional or Windows NT

This chapter describes installation procedures specific to the Microsoft Windows NT or Windows 2000 operating system. There are instructions for installing the OS as well as installing the RAID Software Suite.

Chapter 5, Installing Linux

This chapter describes installation procedures specific to the Linux OS. There are instructions for installing the OS as well as installing the RAID Software Suite.

Chapter 6, Installing Novell NetWare

This chapter describes installation procedures specific to the Novell NetWare operating system. There are instructions for installing the OS as well as installing the RAID Software Suite.



Chapter 7, Installing SCO UnixWare

This chapter describes installation procedures specific to the UnixWare OS. There are instructions for installing the OS and the RAID Software Suite.

Chapter 8, Installing SCO OpenServer

This chapter describes installation procedures specific to the SCO OpenServer OS. There are instructions for installing the OS and the RAID Software Suite.

Chapter 9, Installing Berkeley UNIX FreeBSD

This chapter describes installation procedures specific to the Berkeley UNIX FreeBSD OS. There are instructions for installing the OS and the RAID Software Suite.

1.2.2 User's Guide

The portions of this manual describing the software features contain the following:

Chapter 10, Storage Console

This chapter describes Storage Console (StorCon), a utility for configuring and diagnosing RAID subsystems built on IIR controllers. StorCon is a character-based user interface that is loadable from the Flash-RAM of the IIR controller. StorCon is available for all supported operating systems.

Chapter 11, Storage Console Plus

Storage Console Plus (StorCon+) is a software tool for setting up and maintaining mass storage subsystems based on IIR controllers. StorCon+ is a graphical user interface designed for execution under Win32 operating systems only.

Appendix A, Optional Features

Appendix A provides instructions for server clustering with Microsoft and Novell operating systems and describes PCI Hot Plug. Refer to the Hardware Guide of the specific IIR controller to determine whether the optional features described in this chapter are supported.

Appendix B, Advanced Features

This chapter describes how to use StorCon or StorCon+ to chain several drives to form a large single drive.

Appendix C, Fibre Channel Features

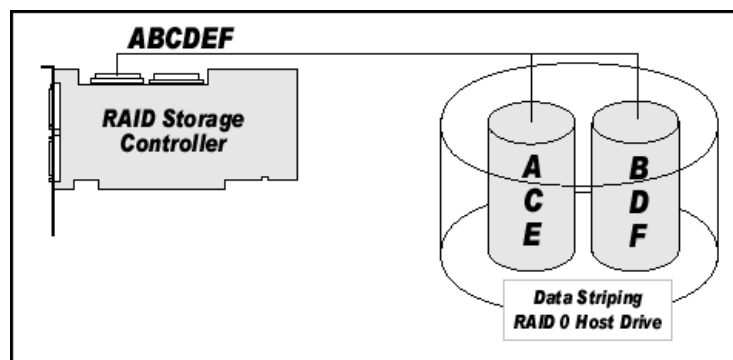
This chapter describes Fibre Channel (FC) functionality with your IIR controller. Fibre Channel functionality does not alter the normal interaction with your RAID controller. In fact, there are no user-definable parameters specific to Fibre Channel. There are however some differences in how information about your Fibre Channel is presented. This chapter covers these differences.

1.3 RAID Levels

1.3.1 RAID 0 - Data Striping

Data blocks are split into stripes based on the adjusted stripe size (for example, 128 KB) and the number of hard disks. Each stripe is stored on a separate hard disk. Significant improvement of the data throughput is achieved using this RAID level, especially with sequential read and write. RAID 0 includes no redundancy. When one hard disk fails, all data is lost.

Figure 1-1. RAID 0 - Data Striping



1.3.2 RAID 1 - Disk Mirroring/Disk Duplexing

All data is stored twice on two identical hard disks. When one hard disk fails, all data is immediately available on the other without any impact on performance and data integrity.

With *Disk Mirroring* (Figure 1-2) two hard disks are mirrored on *one* I/O channel. If each hard disk is connected to a separate I/O channel, it is called *Disk Duplexing* (Figure 1-3).

RAID 1 represents an easy and highly efficient solution for data security and system availability. It is especially suitable for installations which are not too large (the available capacity is only half of the installed capacity).

Figure 1-2. RAID 1 - Disk Mirroring

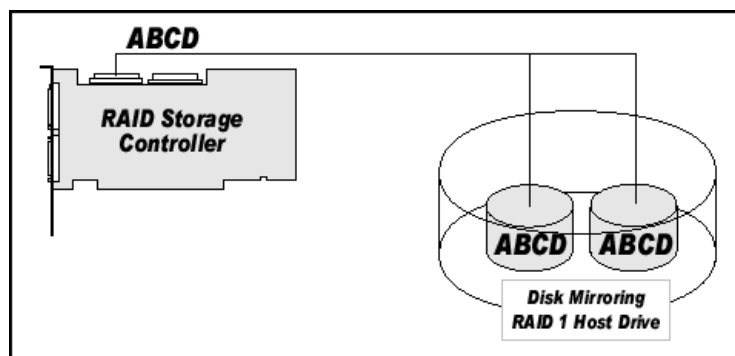
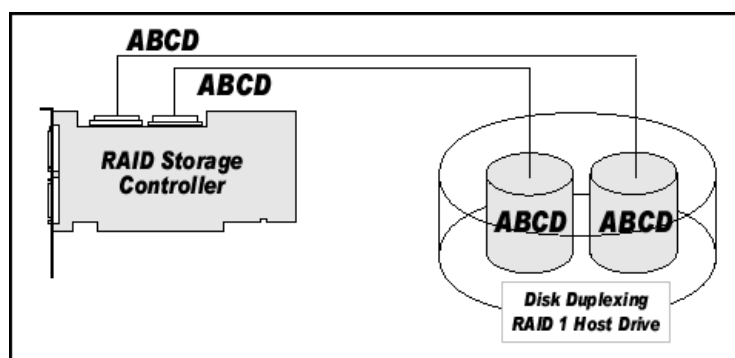


Figure 1-3. RAID 1 - Disk Duplexing

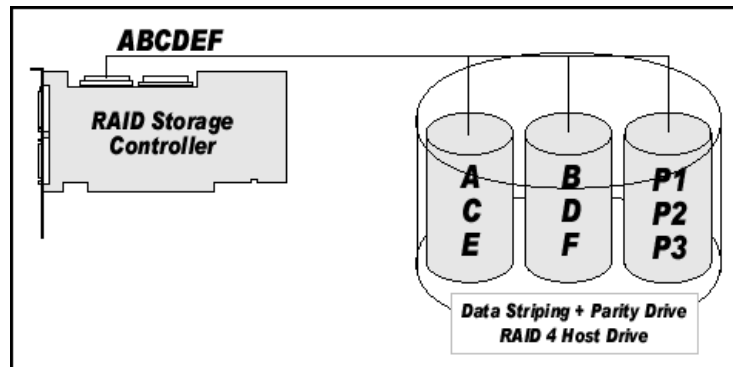


1.3.3 RAID 4 - Data Striping With a Dedicated Parity Drive

RAID 4 works in the same way as RAID 0. The data is striped across the hard disks and the controller calculates redundancy data (parity information) that is stored on a separate hard disk (P1, P2, ...). See [Figure 1-4](#). Should one hard disk fail, all data remains fully available. Missing data is recalculated from existing data and parity information.

Unlike in RAID 1 only the capacity of one hard disk is needed for redundancy. For example, in a RAID 4 disk array with 5 hard disks, 80% of the installed hard disk capacity is available as user capacity, only 20% is used for redundancy. In systems with many small data blocks, the parity hard disk becomes a throughput bottleneck. With large data blocks, RAID 4 shows significantly improved performance.

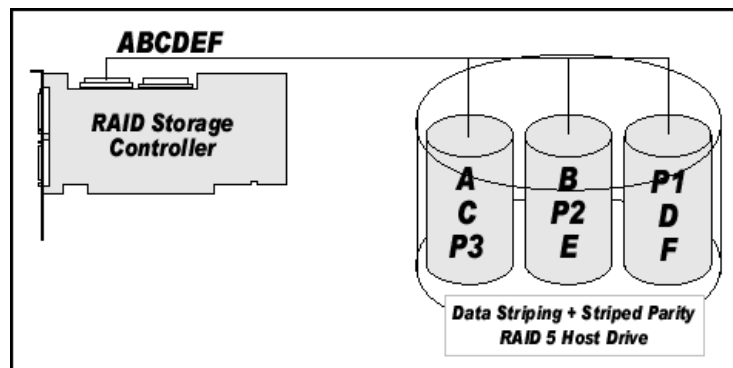
Figure 1-4. RAID 4 - Data Striping With a Dedicated Parity Drive



1.3.4 RAID 5 - Data Striping with Striped Parity

Unlike RAID 4, the parity data in a RAID 5 disk array are striped across all hard disks (Figure 1-5). The RAID 5 disk array delivers a balanced throughput. Even with small data blocks, which are very likely in a multi-tasking and multi-user environment, the response time is very good. RAID 5 offers the same level of security as RAID 4. When one hard disk fails, all data is still fully available. Missing data is recalculated from the existing data and parity information. RAID 4 and RAID 5 are particularly suitable for systems with medium to large capacity requirements, due to their efficient ratio of installed and available capacity.

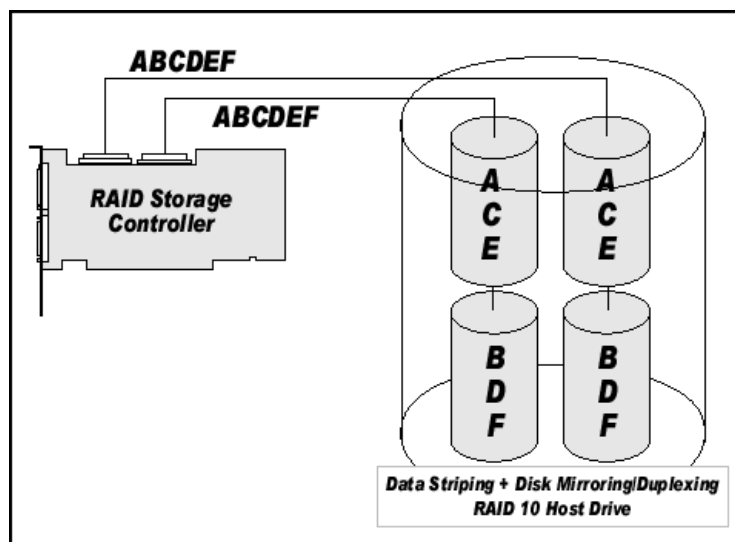
Figure 1-5. RAID 5 - Data Striping with Striped Parity



1.3.5 RAID 10 - Combination of RAID 1 and RAID 0

RAID 10 is a combination of RAID 0 (Performance) and RAID 1 (Data Security). See Figure 1-6. Unlike RAID 4 and RAID 5, there is no need to calculate parity information. RAID 10 disk arrays offer good performance and data security. As in RAID 0, optimum performance is achieved in highly sequential load situations. Identical to RAID 1, 50% of the installed capacity is lost through redundancy.

Figure 1-6. RAID 10 - Combination of RAID 1 and RAID 0



1.3.6 Levels of Drive Hierarchy Within the Intel® Integrated RAID Firmware

The IIR firmware is based on four fundamental levels of hierarchy. Each level has its “own drives” (components). The basic rule is to build up a “drive” on a given level of hierarchy. The “drives” of the next lower level of hierarchy are used as components.

1.3.6.1 Level 1

Physical drives are hard disks and removable hard disks. Some Magneto Optical (MO) drives are located on the lowest level. Physical drives are the basic components of all “drive constructions”. However, before they can be used by the firmware, these hard disks must be “prepared” through a procedure called initialization. During this initialization each hard disk receives information which allows an univocal identification even if the SCSI ID or the controller is changed. For reasons of data coherency, this information is extremely important for any drive construction consisting of more than one physical drive.

1.3.6.2 Level 2

On the next higher level are the *logical drives*. Logical drives are introduced to obtain full independence of the physical coordinates of a physical device. This is necessary to easily change the IIR controller and the channels, IDs, without losing the data and the information on a specific disk array.

1.3.6.3 Level 3

On this level of hierarchy, the firmware forms the *array drives*. Depending on the firmware installed an array drive can be:

- Single Disks: one disk or a JBOD (just a bunch of drives)
- Chaining sets (concatenation of several hard disks)
- RAID 0 array drives
- RAID 1 array drives, RAID 1 array drives plus a hot fix drive
- RAID 4 array drives, RAID 4 array drives plus a hot fix drive
- RAID 5 array drives, RAID 5 array drives plus a hot fix drive
- RAID 10 array drives, RAID 10 array drives plus a hot fix drive

1.3.6.4 Level 4

On level 4, the firmware forms the *host drives*. Only these drives can be accessed by the host operating system of the computer. Drives C, D, etc. under MSDOS etc. are always referred to as host drives by the firmware. The same applies to NetWare and UNIX drives. The firmware automatically transforms each newly installed logical drive and array drive into a host drive. This host drive is then assigned a host drive number which is identical to its logical drive or array drive number.

The firmware is capable of running several kinds of host drives at the same time. For example, in MSDOS, drive C is a RAID 5 type host drive (consisting of 5 SCSI hard disks), drive D is a single hard disk, and drive E is a CD-ROM communicating with IIR firmware through corelSCSI. On this level the user may split an existing array drive into several host drives.

After a capacity expansion of a given array drive the added capacity appears as a new host drive on this level. It can be either used as a separate host drive, or merged with the first host drive of the array drive. Within RAIDCU, each level of hierarchy has its own menu:

Level 1 - Configure Physical Devices

Level 2 - Configure Logical Drives

Level 3 - Configure Array Drives

Level 4 - Configure Host Drives

Generally, each installation procedure passes through these 4 menus, starting with level 1. Installation includes the initializing the physical drives, configuring the logical drives, configuring the array drives (for example, RAID 0, 1, 4, 5 and 10) and configuring the host drives.

1.4 Transparency of Host Drives

The structure of the host drives installed with StorCon (see [Chapter 10, Storage Console](#)) is not known to the operating system. For example, the operating system does not recognize that a given host drive consists of a number of hard disks forming a disk array.



To the operating system this host drive simply appears as one single hard disk with the capacity of the disk array. This complete transparency represents the easiest way to operate disk arrays under the operating system. Neither operating system nor the PCI computer need to be involved in the administration of these complex disk array configurations.

1.4.1 Using CD-ROMs, DATs, Tapes, etc.

A SCSI device that is not a SCSI hard disk or a removable hard disk, or that does not behave like one, is called a *Non-Direct Access Device*. Such a device is *not configured with StorCon and does not become a logical drive or host drive*. SCSI devices of this kind are either operated through the Advanced SCSI programming Interface (ASPI) (MSDOS or Novell NetWare), or are directly accessed from the operating system (UNIX).

Note: Hard disks and removable hard disks are called *Direct Access Devices*. However, there are some Non-Direct Access Devices, for example, certain MO drives, which can be operated just like removable hard disks if they have been appropriately configured (for example, by changing their jumper settings).



Getting Started

2

In order to setup the IIR controller, follow the instructions in the sections below to:

- Determine your RAID level and array configuration
- Create a RAID driver installation diskette
- Install the controller

After completing these steps, refer [Chapter 3](#) for quick installation instructions. For more detailed instructions refer to the other installation chapters ([Chapter 4](#) through [Chapter 9](#)).

2.1 Determine the RAID Configuration

Begin the installation by completing the worksheet in [Table 2-1](#) to determine the RAID level, the number of disk drives, and the disk drive size for your system. Refer to [Section 1.3, RAID Levels](#) for more information about RAID levels and to determine the optimum RAID level solution for your needs.

1. In column 1 of [Table 2-1](#), select a RAID level.
2. In column 2, note the number of disk drives supported for the RAID level you selected.
3. In column 3, record the number of disk drives you will use for the host drive.
4. In column 4, record the capacity, in megabytes (MB), that you will need on each physical drive.

You will enter this value as the “Used Capacity per Drive” when you are creating the host drive. Based on the physical drive capacity value and the number of disk drives you will use, the RAID configuration software will calculate the total host drive size for your selected RAID level.

Note: The capacity of the smallest drive in the initial RAID array configuration becomes the maximum capacity that the RAID configuration software can use for each hard disk in the host drive. This becomes important when you configure an array with hard disks of potentially varying sizes and you want to ensure that future drives added to the disk array will fit in the array (for example, for replacement purposes). Should a new drive have less

than the physical drive capacity used for each disk in the existing disk array, the RAID configuration software could not accept the new drive.

Caution: The size of the host drive cannot be changed (decreased, increased, or expanded) once the host drive has been created.

Table 2-1. Pre-installation Worksheet (Creating a Host Drive for the Operating System)

RAID Level	# of disk drives supported for this RAID level (minimum to maximum)	# of disk drives ¹ to include in new host drive	Physical drive capacity (MB)
RAID 0	2 to 15 per Channel		
RAID 1	2	2	
RAID 4	3 to 15 per Channel		
RAID 5	3 to 15 per Channel		
RAID 10	4 to 15 per Channel ²		
Notes and Cautions	1. The number of disk drives can not be decreased (only increased via the <i>array expansion</i> feature) once the host drive is created. 2. RAID 10 only supports an <i>even</i> total number of disk drives. Additional drives are added in pairs, up to a total of 30 drives over 2 channels.		

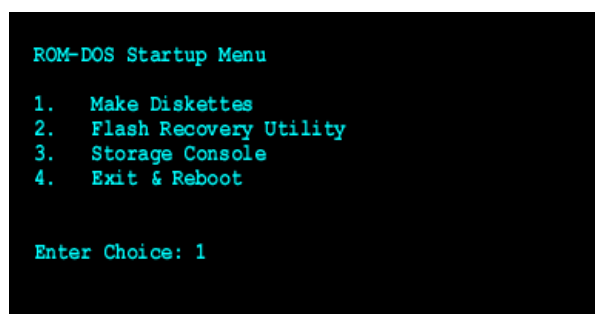
2.2 Create the RAID Driver Installation Diskette

For more information about Linux drivers and updates, see [Table 5-3](#) in [Section 5.1.1, Linux Drivers and Updates](#).

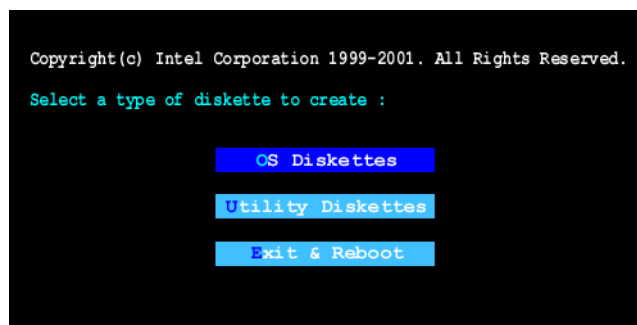
2.2.1 Preferred Method

The RAID Software Suite CD-ROM is self-booting, assuming that your system supports booting from the CD-ROM drive.

1. Change your computer's system BIOS setting so that your system boots from the CD-ROM. Insert the CD-ROM into the system CD-ROM drive and power up the system. The *ROM-DOS Startup Menu* appears (Figure 2-7).

Figure 2-7. ROM-DOS Startup Menu

2. From the menu, select *Make Diskettes*, press <Enter>. The *Select a Type of Diskette to Create* screen appears. See Figure 2-8.

Figure 2-8. Select a Type of Diskette to Create

3. Press <Enter> to select *OS Diskettes*. The *Select an OS to Create* screen appears. See Figure 2-9.

Figure 2-9. Select an OS to Create

4. Highlight the OS to be installed and press <Enter>.

5. Select the specific OS to be installed and press <Enter>.
6. A DOS screen will appear. Follow the instructions to extract the image to diskette. After the diskette is created, the *Select an OS to Create* screen appears (Figure 2-9).
7. Remove the diskette from the floppy drive and set it aside. You will be instructed when to use it during the OS installation.
8. In the *Select an OS to Create* screen select *Main Menu*. The *Select a Type of Diskette to Create* screen appears (Figure 2-8).
9. Select *Exit & Reboot* to reboot the system.
10. Change your computer's system BIOS setting so that your system boots normally (not from the CD-ROM).

2.2.2 Alternative Methods

If you are unable to create the IIR controller installation diskette by using the method described in Section 2.2.1, you can create the disk with the following alternative means:

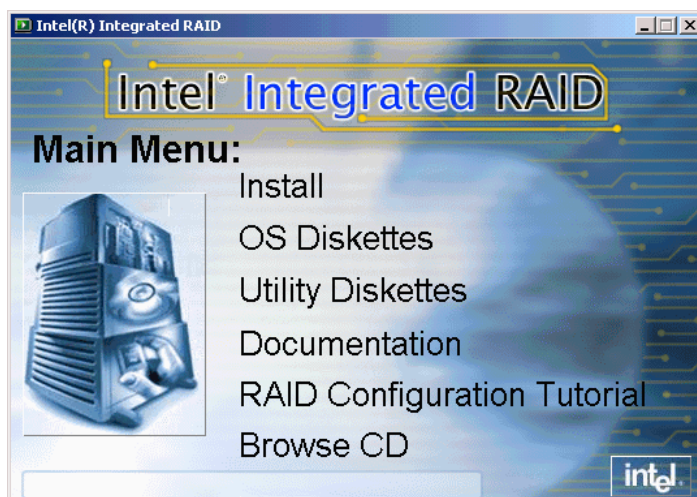
- If you have a Windows 2000 or Windows NT server, you can use the RAID Software Suite CD-ROM on the Windows server to generate an IIR controller driver diskette for any of its supported operating systems (see [Section 2.2.2.1](#)).
- If you do not have a Windows server, you can manually create the diskette for the following operating systems
 - SCO OpenServer (see [Section 2.2.2.2](#))
 - SCO UnixWare (see [Section 2.2.2.3](#))

2.2.2.1 Create IIR Driver for Any Supported OS using a Windows Server

Use the RAID Software Suite CD-ROM on a Windows 2000 or Windows NT server to generate an IIR controller driver diskette for any supported OS.

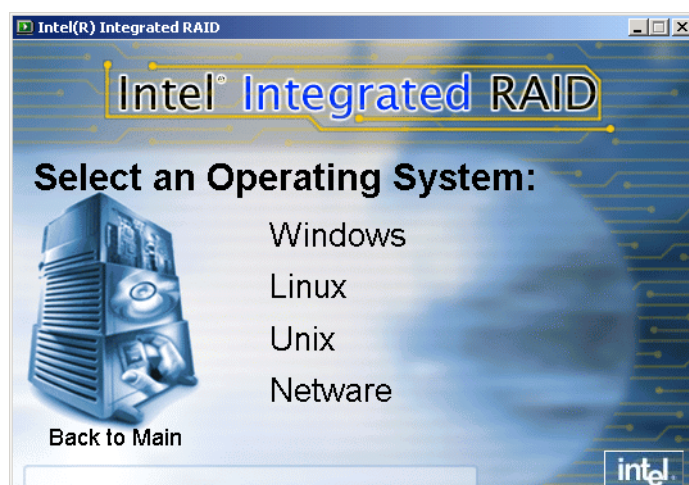
1. Insert the RAID Software Suite CD-ROM into the CD-ROM drive of the Windows server.
2. DemoShield* starts automatically and displays the Intel® Integrated RAID splash screen (see [Figure 2-10](#)). If DemoShield does not start automatically, then run the following file from the CD-ROM drive: <CD-ROM root>\autorun.exe

Figure 2-10. Intel® Integrated RAID Splash Screen



3. Click *OS Diskettes*. The *Select an Operating System* screen appears (see [Figure 2-11](#)). Select the appropriate operating system of the system into which you will install the IIR controller.

Figure 2-11. Select an Operating System Screen



4. Select the screen options that are appropriate for your specific operating system version.
5. A command prompt window appears requesting that you insert a formatted floppy diskette.
6. Insert the floppy in the floppy drive and press Enter. The command prompt window closes automatically after the diskette has been written.
7. Exit the DemoShield by pressing <Esc> or clicking on the window's Close icon (the 'X' at the upper right corner of [Figure 2-11](#)).

2.2.2.2 Create OpenServer IIR Driver

1. On a OpenServer system, insert the RAID Software Suite CD-ROM and go to the *apps* folder.
2. Create a folder on the system hard drive and copy the rawrite.exe application to that folder.
3. Open the *Opensv5x* folder on the CD-ROM, then open the *dskimg* folder.
4. Copy *sco5x.img* to the folder created in [step 2](#).
5. Open a command window. From the command prompt, go to the folder created in [step 2](#) and type the following command: “rawrite”.
6. Enter the file name: *sco5x.img*.
7. Insert a blank floppy diskette in the drive and follow the instructions on screen.

2.2.2.3 Create SCO UnixWare IIR Driver

1. On a SCO UnixWare server, insert the RAID Software Suite CD-ROM and go to the *apps* folder.
2. Create a folder on the system hard drive and copy the rawrite.exe application to that folder.
3. Open the *unixware* folder on the CD-ROM, then open the *dskimg* folder.
4. Copy *unixw7.img* to the folder created in [step 2](#).
5. Open the command window. From the command prompt, go to the folder created in [step 2](#) and type the following command: “rawrite”.
6. Enter the file name: “unixw7.img” and the floppy drive name (usually “a:”).
7. Insert a blank floppy diskette in the drive and follow instructions on screen.

2.3 Install the IIR Controller

Refer to the Hardware Guide for the detailed installation procedure for your IIR controller.

Warning: SHOCK HAZARDS may be present inside the unit in which this card is being installed. Disconnect all power cords to the unit before removal of any covers. Follow the warnings noted in your computer's user or service manual before installing this board. ONLY after all the covers are reinstalled should you reconnect the power cords and power up the computer for the software installation and use.

1. Power off the computer, disconnect power cord(s) and remove the system cover (consult the documentation that came with your computer system).
2. Install the IIR controller into an available PCI slot that is applicable for the product (refer to the accompanying Hardware Guide for more details).
3. Connect cables. If using SCSI, ensure that the end of the SCSI bus is properly terminated. Consult the accompanying Hardware Guide for cable and SCSI bus termination details.



4. If the IIR controller is configured with removable SDRAM, be sure that the DIMM is installed in the adapter prior to use. *Ensure that the optional battery backup is disconnected during any installation or removal of the DIMM.* Not all adapters are configured with removable SDRAM or battery backup support. For installation details and applicability to your IIR controller, refer to the Hardware Guide.
5. Replace the system cover and reconnect power cord(s).

After installing the adapter, go to the appropriate operating system chapter for your needs to continue the installation.

Quick Installation

3

This chapter covers the quick installation of the IIR controller hardware and software on a newly created bootable host drive with the following operating systems:

- Microsoft Windows 2000
- Microsoft Windows NT 4.0
- Novell NetWare 4.2x, 5.x and 6.x
- SCO UnixWare 7.1.1 and 8.0

Refer to [Chapter 4](#), [Chapter 6](#) and [Chapter 7](#) for more complex installations on these same operating systems. Refer to [Chapter 5](#), [Chapter 8](#) and [Chapter 9](#) for installations with other operating systems.

3.1 Roadmap for Quick Installation

Follow the high level steps in [Table 3-2](#) below to complete the quick installation..

Table 3-2. High Level Steps for Quick Installation

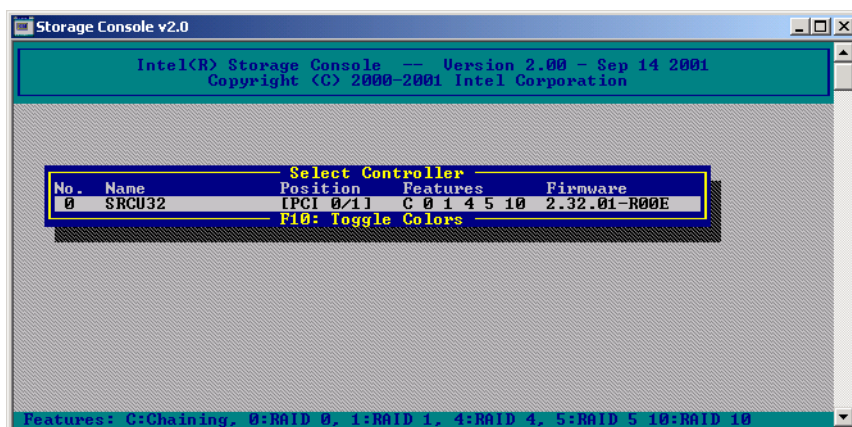
Step	Reference
1. Determine RAID configuration	See “Determine the RAID Configuration” on page 24.
2. Create RAID driver installation diskette	See “Create the RAID Driver Installation Diskette” on page 25.
3. Install the IIR controller	See “Install the IIR Controller” on page 29.
4. Create a bootable host drive	<ul style="list-style-type: none"> • See “Create a Bootable Host Drive—RAID 1 Mirrored Array” on page 32. OR <ul style="list-style-type: none"> • See “Create a Bootable Host Drive—RAID 5 Disk Array with Hot Fix” on page 35.
5. Install the OS onto the host drive	<ul style="list-style-type: none"> • See “Microsoft Windows 2000 and Windows NT Quick Installation” on page 40. OR <ul style="list-style-type: none"> • See “Novell NetWare 4.2x, 5.x and 6.x Quick Installation” on page 41. OR <ul style="list-style-type: none"> • See “SCO UnixWare 7.1.1 and 8.0 Quick Installation” on page 44.
6. Install RAID software	See “RAID Software Suite Quick Installation” on page 45.

3.2 Create a Bootable Host Drive—RAID 1 Mirrored Array

Storage Console (StorCon) is the software tool used for creating host drives as well as administering the RAID subsystem. This section describes how to create a bootable host drive in a RAID 1 mirrored array configuration via the expansion ROM (XROM) StorCon. See [Section 3.3](#) for an example of a RAID 5 disk array with hot fix drive configuration.

1. Power on the computer.
2. Press <Ctrl>+<g> when the IIR BIOS message appears to load XROM StorCon.
3. Select the controller and press Enter. See [Figure 3-12](#).

Figure 3-12. Select Controller



4. Select the menu option *Configure Host Drives* and press Enter. See [Figure 3-13](#).

Figure 3-13. Configure Host Drives

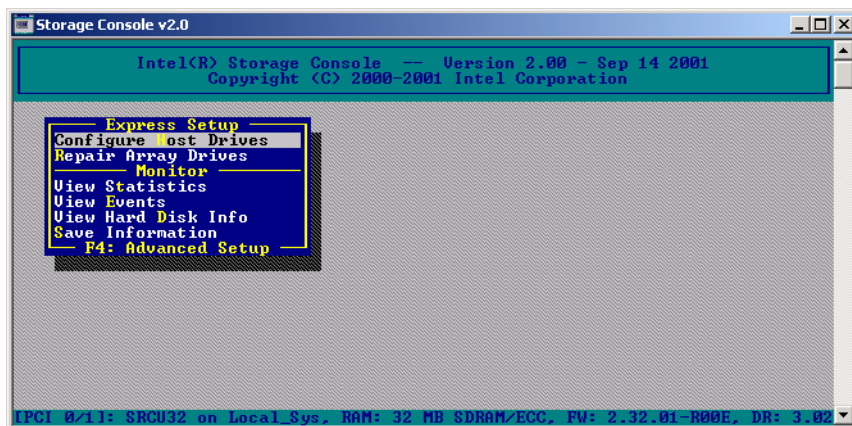
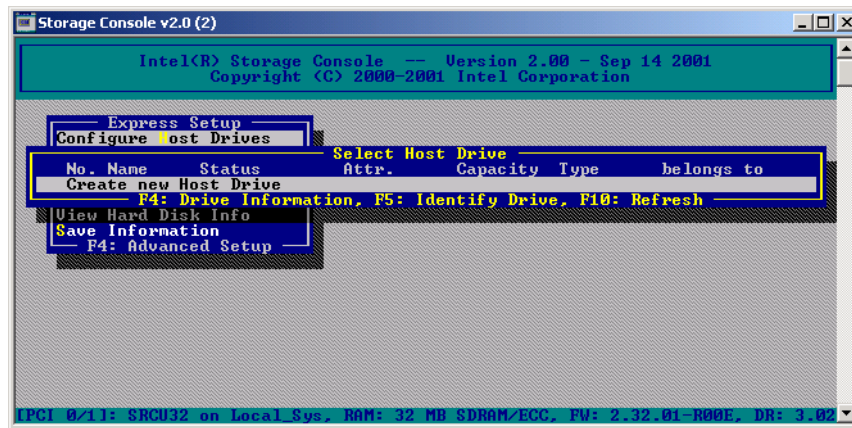
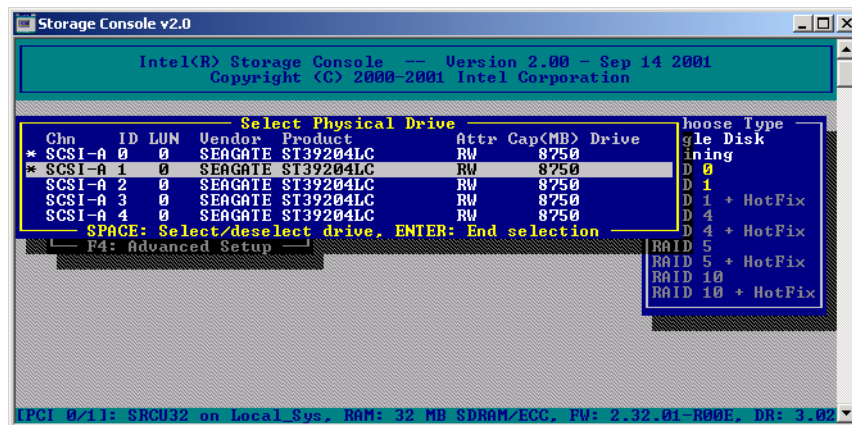


Figure 3-14. Create New Host Drive



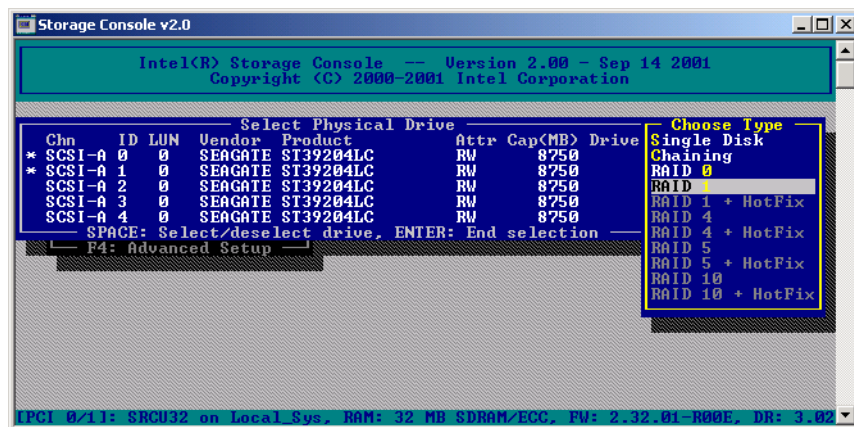
5. Select *Create new Host Drive* (see Figure 3-14) and press Enter. StorCon displays a list of available hard disks (see Figure 3-15).
6. Use the arrow keys and the Space bar to select two hard disks (these hard disks become marked with an "*" as shown in Figure 3-15) and press Enter.

Figure 3-15. Select Physical Drive



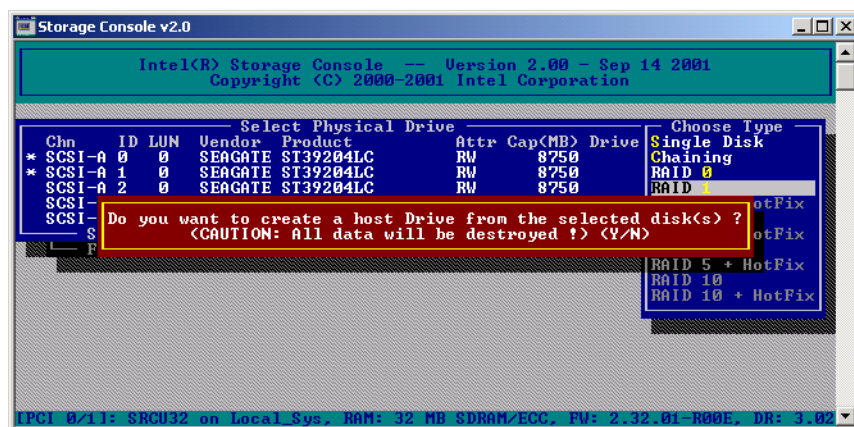
7. From the *Choose Type* menu, select RAID 1 and press Enter. See Figure 3-16.

Figure 3-16. Choose Type Menu



8. StorCon displays a warning that all data on the selected disks will be destroyed (see [Figure 3-17](#)). Confirm your choice by pressing <y>.

Figure 3-17. Host Drive Creation Confirmation



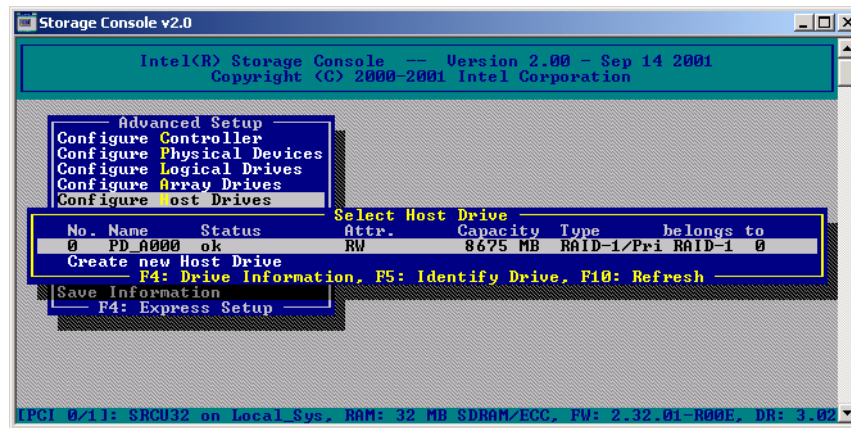
9. StorCon asks for the capacity to use for each drive (see [Figure 3-18](#)). Type in the physical drive capacity that you recorded in [Table 2-1](#) for RAID 1 and press Enter.

Figure 3-18. Drive Capacity



10. StorCon pauses to determine if you want to configure the selected disks for SAF-TE Auto Hot Plug. Press <y> or <n> to confirm your choice.
11. StorCon asks if you want to set the host drive type to *Cluster*. Refer to your product's Hardware Guide to determine if clustering is supported before pressing <y> or <n> to confirm your choice.
12. The new host drive is created (see [Figure 3-19](#)). When the build process is completed, the RAID 1 disk array changes to *ready* status, for example, the data is fully redundant.

Figure 3-19. Newly Created Host Drive



13. Exit StorCon by pressing <Esc> several times to escape out of the various menus and pressing <y> to quit.

Follow the instructions in the next section to continue the installation.

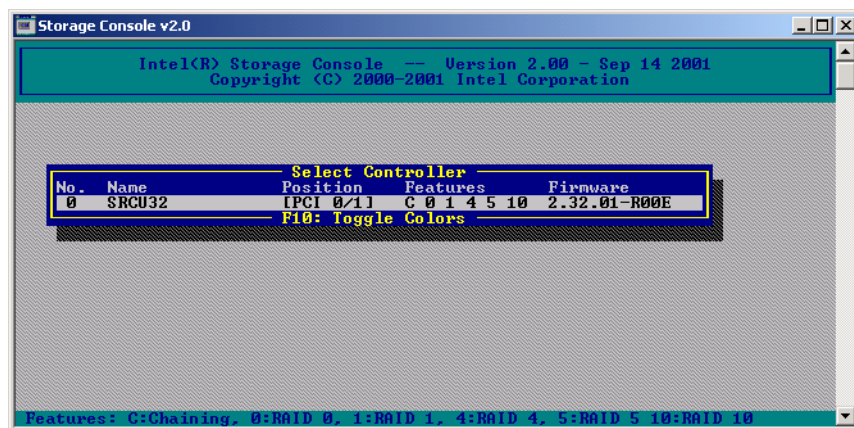
3.3 Create a Bootable Host Drive—RAID 5 Disk Array with Hot Fix

Storage Console (StorCon) is the software tool used for creating host drives as well as administering the RAID subsystem. This section describes how to create a bootable host drive in a RAID 1 mirrored array configuration via the expansion ROM (XROM) StorCon. See [Section 3.2](#) for an example of a RAID 1 mirrored array.

1. Power on the computer.
2. Press <Ctrl>+<g> when the IIR BIOS message appears to load XROM StorCon.

3. Select the controller and press Enter. See [Figure 3-20](#).

Figure 3-20. Select Controller



4. Select the menu option *Configure Host Drives* and press Enter. See [Figure 3-21](#).

Figure 3-21. Configure Host Drives

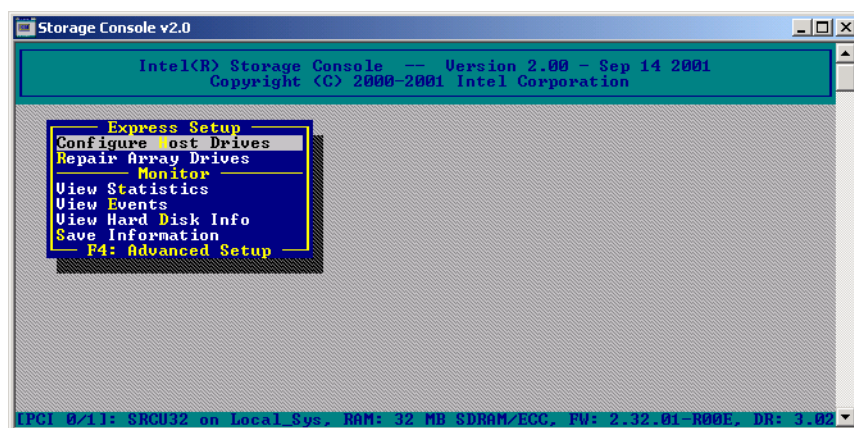
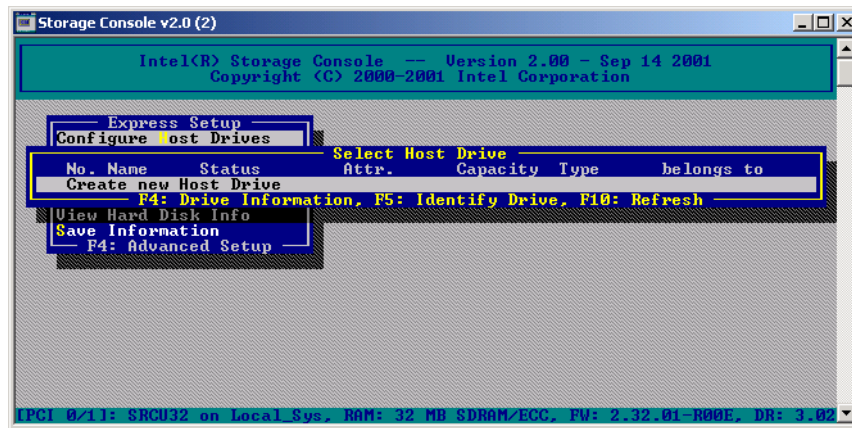
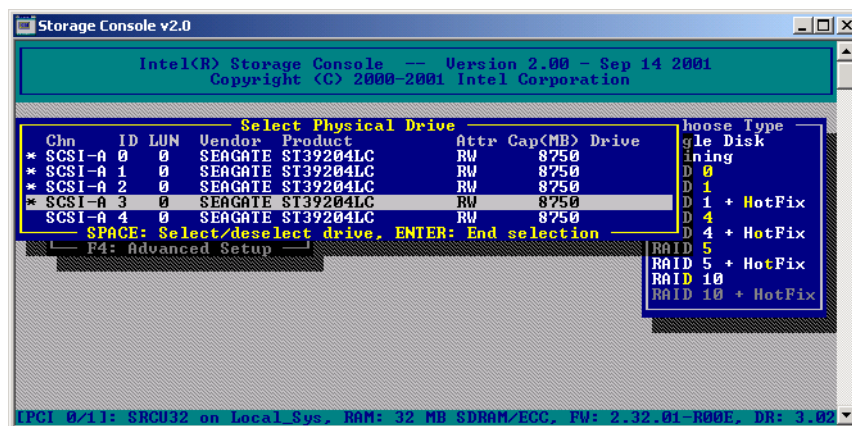


Figure 3-22. Create New Host Drive



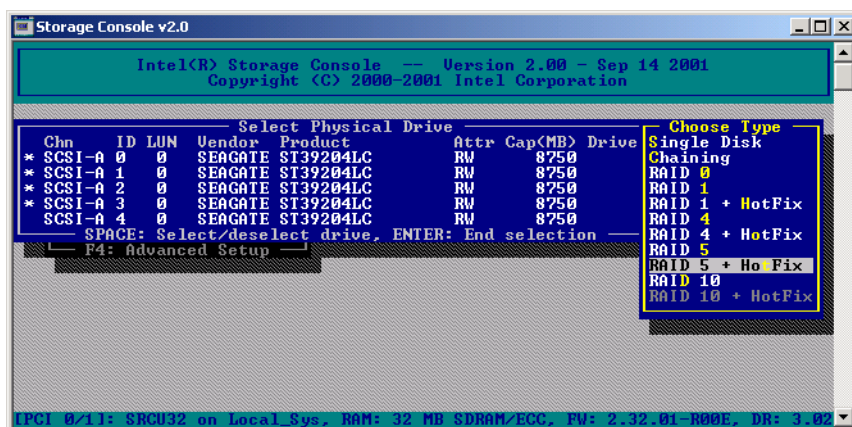
5. Select *Create new Host Drive* (Figure 3-22) and press Enter. StorCon displays a list of available hard disks (Figure 3-23).
6. Use the arrow keys and the Space bar to select the number of hard disks for your RAID 5 array (minimum of three disks to a maximum of 15 disks per channel). In this RAID 5 + HotFix example, four disks are selected. The selected hard disks become marked with an "*" as shown in Figure 3-23. Press Enter to accept your selections.

Figure 3-23. Select Physical Drive



- From the *Choose Type* menu, select *RAID 5 + HotFix* and press Enter. See [Figure 3-24](#).

Figure 3-24. Choose Type Menu



- StorCon displays a warning that all data on the selected disks will be destroyed (see [Figure 3-25](#)). Confirm your choice by pressing <y>.

Figure 3-25. Host Drive Creation Confirmation

```
Do you want to create a host Drive from the selected disk(s) ?
(CAUTION: All data will be destroyed !) (Y/N)
```

- StorCon asks for the capacity to use for each drive (see [Figure 3-26](#)). Type in the physical drive capacity that you recorded in [Table 2-1](#) for RAID 5 and press Enter.

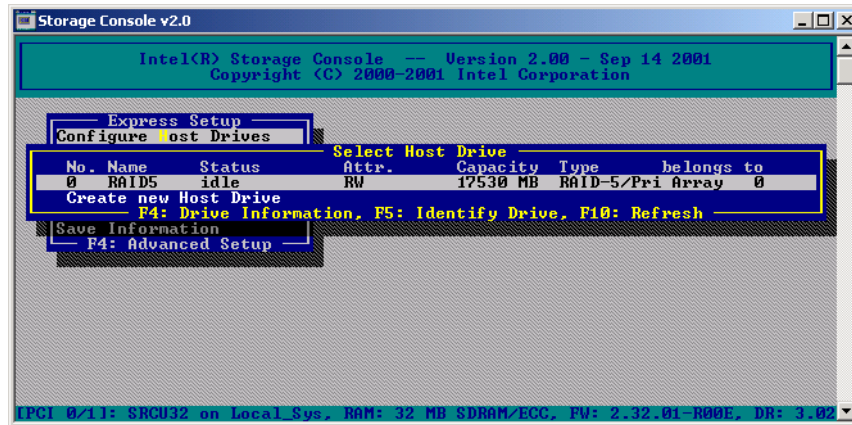
Figure 3-26. Drive Capacity

```
Used Capacity per Drive (1..8750 MB): _
```

- StorCon asks if you want to set the host drive type to 'Cluster'. Refer to your product's Hardware Guide to determine if clustering is supported before pressing <y> or <n> to confirm your choice.

The new host drive is created. See [Figure 3-27](#).

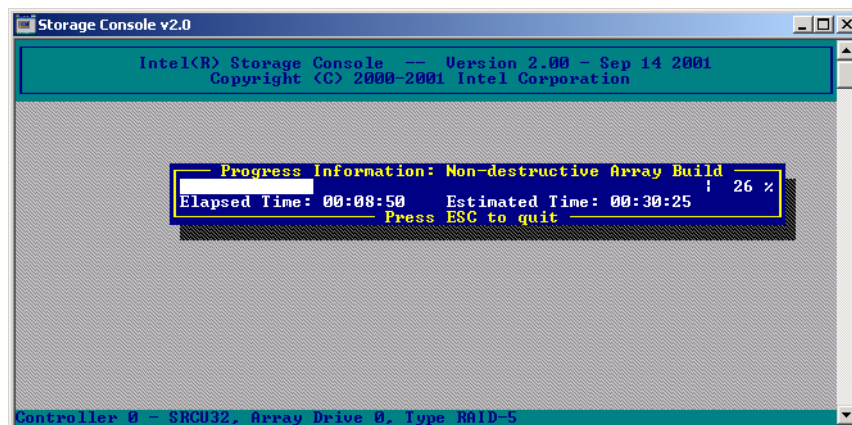
Figure 3-27. Newly Created Host Drive



- Exit StorCon by pressing <Esc> several times to escape out of the various menus and pressing <y> to quit.

Depending on the size of the host drive, the RAID 5 build process may take a considerable amount of time. You may exit out of StorCon without waiting for the build to complete. When leaving StorCon, a progress window informs you about the estimated completion time for the build process (see [Figure 3-28](#)).

Figure 3-28. Progress Window



Upon successful completion of the build process the RAID 5 disk array changes to *ready* status, for example, the data is fully redundant.



You may continue the installation by following the instructions in:

- [Section 2.2, Create the RAID Driver Installation Diskette](#)
- Either section [3.4](#), [3.5](#), or [3.6](#), for the applicable OS for your system
- [Section 3.7, RAID Software Suite Quick Installation](#).

3.4 Microsoft Windows 2000 and Windows NT Quick Installation

This section covers installing the IIR controller and the OS to a host drive for local administration of the RAID subsystem. For other Windows installation scenarios, see [Chapter 4](#).

3.4.1 Minimum Requirements

Microsoft Windows 2000

- RAID Software Suite CD-ROM
- 9 MB of free hard disk space (for the RAID Software Suite)
- Microsoft Windows 2000 Professional†, Server† or Advanced Server†
- RAID Software Suite Driver Installation diskette (see [Section 2.2](#) for instructions to create this diskette)
 - One blank high density floppy diskette† may be required to create the installation diskette

Microsoft Windows NT 4.0

- RAID Software Suite CD-ROM
- 9 MB of free hard disk space (for the RAID Software Suite)
- RAID Software Suite Driver Installation diskette (see [Section 2.2](#) for instructions to create this diskette)
 - One blank high density floppy diskette† may be required to create the installation diskette
- Microsoft Windows NT 4.0 Workstation†, Server† or Server Enterprise Edition†

† Not supplied

3.4.2 OS Installation Procedures

The following installation procedures highlight the Windows setup options that you must install during OS installation to successfully prepare the operating system for the installation of the RAID Software Suite.

These procedures cover installing the IIR controller and the OS to a host drive for local administration of the RAID subsystem. For all other installation scenarios, please consult the accompanying Software Guide.

Install the operating system software *using one of the scenarios below* which matches your installation method.

Note: For detailed Windows installation procedures, please consult the documentation that came with your computer system or operating system.

3.4.2.1 Installing Windows Using the Installation Boot Diskettes

1. Insert the bootable floppy diskette and power on the computer.
2. Let Windows detect the storage devices in your system. When device detection is complete, press *S* to specify additional storage devices.
3. Select *Other*. Insert the RAID Software Suite Driver Installation diskette for Windows into the floppy drive, press <Enter>.
4. The IIR Controller is automatically selected. Press <Enter>.
5. Complete the text-based portion of the Windows installation procedures. Reboot and continue with the GUI-based portion of the installation.
6. After the operating system is completely installed, go to [Section 3.7](#) to complete the installation.

3.4.2.2 Installing Windows Using the Bootable Windows CD-ROM

1. Insert the bootable floppy diskette and power on the computer.
2. **Press *F6* as soon as the initial blue screen appears** to ensure that the RAID Driver Installation diskette can be loaded when specifying *Other*.
3. When device detection is complete, press *S* to specify additional storage devices.
4. Select *Other*. Insert the RAID Software Suite Driver Installation diskette for Windows into the floppy drive. Press <Enter>.
5. The IIR Controller is automatically selected. Press <Enter>.
6. Complete the text-based portion of the Windows installation procedures. Reboot and continue with the GUI-based portion of the installation.
7. After the operating system is completely installed, go to [Section 3.7](#) to complete the installation.

3.5 Novell NetWare 4.2x, 5.x and 6.x Quick Installation

This section provides quick installation instructions for NetWare. For more detailed installation instructions or for other installation scenarios, see [Chapter 6](#).



3.5.1 Minimum Requirements

- RAID Software Suite CD-ROM
- 20 MB of free hard disk space
- RAID Software Suite Driver Installation Diskette for NetWare (see [Section 2.2](#) for instructions to create this diskette).
 - One blank high density floppy diskette† may be required to create the installation diskette
- Novell NetWare 4.2x† or 5.x† software

† Not supplied

3.5.2 OS Installation Procedures

3.5.2.1 New Installation of NetWare 4.20 with the SRCRX.HAM Driver

1. Create a driver diskette from the RAID Software Suite CD-ROM. See [Section 2.2](#) for details to create this disk.
2. Start the OS installation from the NetWare CD-ROM. (NetWare 4.2x CD-ROMs are NOT bootable so you must have a bootable DOS partition installed on your target hard drive and have the appropriate DOS driver for your CD-ROM.)
3. At the driver summary menu select *modify drivers*.
4. Insert the driver diskette into drive A:
5. Press <Enter> on the IIR driver list.
6. Press <Insert> in the IIR controller driver menu.
7. Press <F3> and change the path to A:\DRIVERS\4XX then press <Enter>.
8. Select the SRCRX.HAM driver and complete the installation.

3.5.2.2 New Installation of NetWare 5.0 with the SRCRX.HAM Driver

Important: The SRCRX.HAM driver depends on a later version of the NWPA.NLM than was shipped on the NetWare 5.0 CD. Without the NWPA.NLM update, the SRCRX.HAM driver will fail to load. The following procedure will allow you to upgrade the NWPA.NLM on the fly during OS installation.

1. Create a driver diskette from the RAID Software Suite CD-ROM. See [Section 2.2](#) for details to create this disk.
2. Start the OS installation from the NetWare bootable CD-ROM.
3. The NetWare installation will eventually load a "Welcome" screen asking you to verify the startup directory (C:\NWSERVER).
4. Press <Alt>+<F10> to exit the installation.
5. At the NetWare console prompt, type "down" and press Enter (the installation exits to the boot drive's DOS prompt).

6. Insert the driver diskette into drive A:.
7. If your NetWare startup directory is drive C:, then run A:\INSTALL\NWUPDATE.BAT, otherwise create a subdirectory named NWUPDATE at the root of your boot drive and copy all the files from A:\DRIVERS\5XX to the NWUPDATE subdirectory.
8. Leave the NetWare 5.0 bootable CD in place, but remove the driver diskette from drive A:.
9. Reboot the server. After rebooting the server, the NetWare 5.0 Install will start again.
10. Right after the Accept the License Agreement screen, select the "Continue with Existing Partition" option.

Note: If you chose to install a "New Server," you may encounter the following warning dialog box:

“Warning: A previously installed version of NetWare was detected in C:\NWSERVER. If you choose to install a new server, all data on the existing server will be lost. <Press ENTER to continue>”.

If the warning dialog box appears, press Enter.

11. Complete the installation.

3.5.2.3 New Installation of NetWare 5.1x with the SRCRX.HAM Driver

1. Create a driver diskette from the RAID Software Suite CD-ROM. See [Section 2.2](#) for details to create this disk.
2. Start the OS installation from the NetWare bootable CD-ROM.
3. At the storage driver summary menu select *modify drivers*.
4. Insert the driver diskette into drive A:
5. Press <Enter> on the storage driver list.
6. Press <Insert> in the storage controller driver menu.
7. Press <F3> and change the path to A:\DRIVERS\5XX then press <Enter>.
8. Select the SRCRX.HAM driver.
9. Complete the installation.

3.5.2.4 New Installation of NetWare 6.x with the SRCRX.HAM Driver

1. Start the OS installation from the NetWare bootable CD-ROM. The SRCRX.HAM driver is on the NetWare 6.x CD and is installed automatically if a RAID controller is detected.
2. After installing the operating system, install all patches and updates from Novell and update the SCSRX.HAM driver. For information on updating the SCSRX.HAM driver, refer to the Software Guide.

3.6 SCO UnixWare 7.1.1 and 8.0 Quick Installation

This section provides quick installation instructions for UnixWare. For more detailed installation instructions or for other installation scenarios, see [Chapter 7](#).

3.6.1 Minimum Requirements

- RAID Software Suite CD-ROM
- 20 MB of free hard disk space
- RAID Software Suite Driver Installation diskette for UnixWare (see [Section 2.2](#) for instructions to create this diskette).
 - One blank high density floppy diskette† may be required to create the installation diskette
- SCO UnixWare 7.1.1 or 8.0 OS software†

† Not supplied

3.6.2 OS Installation Procedures

Note: When installing SCO UnixWare, create only one RAID device (host drive) on which the operating system is to be installed.

1. Create and configure *one* RAID device from the BIOS of IIR Storage Console (accessed by pressing <Ctrl>+<g>).
2. Insert the UnixWare installation diskette 1 of 2 which was included with your OS user's manual. Installation begins.

During installation, UnixWare prompts you to insert a Host Bus Adapter (HBA) diskette. Insert the RAID Software Suite Driver Installation diskette. If you do not have the diskette for the operating system that you are installing, then create it before continuing. See [Section 2.2](#) for instructions to create this disk.
3. During the installation of UnixWare 7.11 (this does not apply to UnixWare 8.0), you will be prompted to install the Network Information Services (NIS) package. By default the installation will configure your system as an NIS client. See your system administrator for configuration of the NIS services.

Note: Installation of this service may take an extended period of time.

If you do not plan on using the NIS or there is not an NIS server present on your network that you are installing this system onto, defer installation of NIS at this time by pressing <F8> at the NIS configuration screen.

3.7 RAID Software Suite Quick Installation

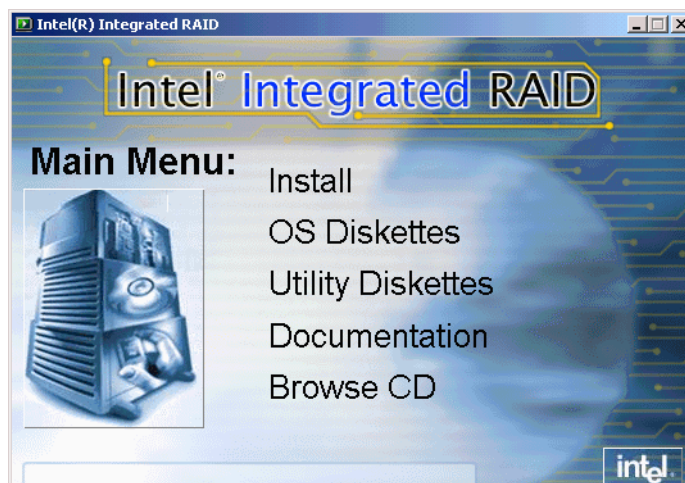
3.7.1 Microsoft Windows 2000 and NT 4.0

1. Log into Windows using a user account with administrative rights.
2. Insert the RAID Software Suite CD-ROM in the CD-ROM drive. When the Intel® Integrated RAID splash screen (see [Figure 3-29](#)) appears, click on the link *Install*, to launch the *Setup* program.

Note: If the RAID Software Setup Splash Screen does not appear, then run the setup.exe file that resides at:

```
<CD-ROM root>\windows\install\setup.exe
```

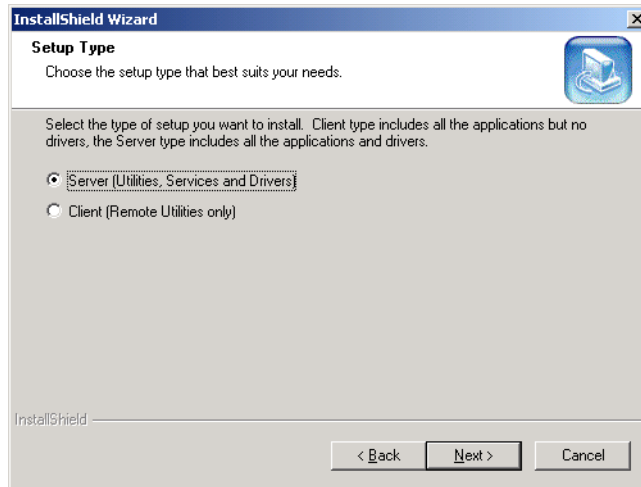
Figure 3-29. RAID Software Setup Splash Screen



3. A welcome screen appears. Click *Next*.
4. License Agreement - Click *Yes* after reading to agree.
5. Setup Type - Select one of the following for Local or Remote administration of the IIR controller (see [Figure 3-30](#)) and click *Next*:
 - Server (Utilities, Services and Drivers)
This option allows for local administration of the IIR controller.
 - Client (Remote Utilities only)

This option allows for remote administration of the IIR controller.

Figure 3-30. Setup Type



6. Choose the default selections (recommended) or select components that you wish to install. Click *Next* to continue the installation.
7. Choose the Destination Location - Use the default directory for installation, click *Next*.
8. Select the Program Folder - Use default Program Group, click *Next*.
9. After the file copy completes, click to complete the installation. Restart the computer after you install the device drivers.

This completes the installation procedure for Windows.

3.7.2 Novell NetWare 4.2x, 5.x and 6.x

3.7.2.1 Installing the IIR Controller Tools Kit Package

Note: StorCon.NLM will not find any controllers unless SRCRX.HAM is already loaded and running.

1. Select *Product options*, then *Install a product not listed*.
2. Change the path to A:\INSTALL and press <Enter> to continue.
3. Select *Storage RAID Controller Tools Kit (StorCon.NLM)* by setting the cursor on its menu item and pressing the space bar (an X will appear in the item's checkbox).
4. Press <F10> to accept the selected item.
5. NetWare will copy the necessary files, automatically load StorCon.NLM, and modify the AUTOEXEC.NCF file to load StorCon.NLM for each subsequent restart of the server.

3.7.2.2 Configuring Tools for Remote Access

1. Create a group SRC_Operator in the NDS.
2. Add the Admin and all other users who will use this interface.
3. Load SRCIPX.NLM.
4. Start Storage Console (StorCon.exe) or Storage Console Plus (StorCon+.exe) from a workstation using a user name of the group SRC_Operator and his/her NetWare password.

3.7.3 SCO UnixWare 7.1.1 or 8.0

No additional steps are necessary to install the RAID Software Suite once you have completed the installation described in [Section 3.6](#).



Installing Microsoft Windows 2000, Windows XP Professional or Windows NT 4

This section covers installation issues related to the Microsoft Windows 2000, Windows XP Professional, and Windows NT operating systems. For a successful installation, study your specific Operating System manuals thoroughly. The required drivers described in this section can be created from the RAID Software Suite CD-ROM.

4.1 Operating System Installation Procedures

Note: Begin the installation process in this chapter if you are installing the OS and the IIR controller or upgrading from the Windows NT OS (the OS is currently installed on a compatible IIR controller) to Windows 2000.

Your installation falls into one of two categories:

- Install the OS on either a host drive or single disk that is attached to and configured on the IIR controller that you are installing (see [Section 4.1.2](#)), or
- Install the OS on either an IDE hard disk or a SCSI hard disk that is not attached to the IIR controller that you are installing (see [Section 4.1.3](#))

4.1.1 Pre-Installation Requirements Checklist

4.1.1.1 Minimum Hardware Requirements

For detailed hardware requirements, specifications, and installation procedures specific to your IIR controller, consult the Hardware Guide.

4.1.1.2 Computer System Requirements

- Computer with CD-ROM Drive
- One available PCI slot
- IIR controller
- PCI 2.2 compliant system BIOS
- SCSI hard disk drives (the minimum needed to meet desired RAID level requirements)

4.1.1.3 Minimum Software Requirements

Microsoft Windows 2000

- RAID Software Suite CD-ROM
- 9 MB of free hard disk space (for the RAID Software Suite)



- Microsoft Windows 2000 Professional†, Server† or Advanced Server†
- RAID Software Suite Driver Installation diskette (Miniport diskette for Windows 2000)
 - One blank high density floppy diskette† may be required to create the installation diskette

Microsoft Windows NT 4.0

- RAID Software Suite CD-ROM
- 9 MB of free hard disk space (for the RAID Software Suite)
- RAID Software Suite Driver Installation diskette (Miniport diskette for Windows NT 4.0)
 - One blank high density floppy diskette† may be required to create the installation diskette
- Microsoft Windows NT 4.0 Workstation†, Server† or Server Enterprise Edition†

Microsoft Windows XP Professional

- RAID Software Suite CD-ROM
- 9 MB of free hard disk space (for the RAID Software Suite)
- Microsoft Windows XP Professional†
- RAID Software Suite Driver Installation diskette (Miniport diskette for Windows XP Professional)
 - One blank high density floppy diskette may be required to create the installation diskette

† Not supplied

4.1.2 Installing an Operating System onto a Host Drive

Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before continuing with the installation of the OS onto a host drive.

4.1.2.1 Create a Host Drive

Refer to the Quick Start Guide or [Chapter 10, “Storage Console,”](#) for details on using the expansion ROM version of Storage Console to create a host drive.

After creating the host drive, follow the steps in the next section to continue the installation.

4.1.2.2 Windows 2000 / XP Professional / NT 4.0 Installation Procedures

Note: This document, when referring to Windows 2000, Windows XP and Windows NT, applies to the following Windows operating systems unless otherwise noted:

- Windows 2000 Server, Advanced Server, and Professional



- Windows XP Professional
- Windows NT 4.0 Server, Enterprise Edition, Terminal Server Edition, and Workstation

4.1.2.3 Installing the OS

The following procedures highlight the Windows setup options that you must install during OS installation to successfully prepare the operating system for the installation of the RAID Software Suite.

Install the operating system software *using one of the scenarios below* which matches your installation method.

Note: For detailed Windows installation procedures, please consult the documentation that came with your computer system or operating system.

Installing Windows Using the Installation Boot Diskettes

1. Insert the first bootable floppy diskette and power on the computer.
2. Let Windows detect the storage devices in your system. When device detection is complete, press *S* to specify additional storage devices.

Note: For Windows XP, skip steps 3 and 4 and proceed to step 5.

3. Select *Other*. Insert the RAID Software Suite Driver Installation diskette for Windows into the floppy drive, press <Enter>.
4. The IIR controller is automatically selected. Press <Enter>. Press <Enter> again to continue installation.
5. Follow the on-screen instructions to complete the text-based portion of the Windows installation procedures. Reboot and follow the on-screen instructions to continue with the GUI-based portion of the installation.
6. After the operating system is completely installed, go to [Section 10.2, Installing and Launching StorCon](#) to complete the installation.

Installing Windows Using the Bootable Windows CD-ROM

1. Boot your computer to the CD-ROM of your Windows OS.
2. Press F6 key as soon as the initial blue screen appears to load the RAID drivers. Note: If installing Windows XP, after having pressed F6, be sure NOT to press F2 when prompted.
3. When prompted press *S* and insert the IIR controller Installation diskette and press Enter indicate diskette is ready then press Enter again to select RAID Controller. When indicated, press Enter a third to continue Windows OS installation.
4. Follow on-screen prompts to complete the text-based portion of the installation and an auto-reboot will occur to continue the GUI portion of your Windows OS installation. DO NOT touch any key if prompted to boot from the CD-ROM. Let the computer boot to the hard drive to continue the installation. When the GUI portion of setup completes the computer will auto-reboot. If it does not auto-reboot, manually reboot the computer to continue the installation.



Note: As of this writing, this software package had not passed Windows Logo testing for Windows XP. However, certification is anticipated in the very near future. As a result, a window may appear notifying you about the Windows Logo testing compatibility. You can simply click on Yes when prompted to continue your installation.

5. After the operating system is completely installed, go to [Section 10.2, Installing and Launching StorCon](#) to complete the installation.

4.1.3 Installing an OS onto an IDE or SCSI Disk Drive not Attached to the IIR Controller

4.1.3.1 Windows 2000 / XP Professional / NT 4.0 Installation Procedures

Note: This document, when referring to Windows 2000 and Windows NT, applies to the following Windows operating systems:

- Windows 2000 Server, Advanced Server, and Professional
- Windows XP Professional
- Windows NT 4.0 Server, Enterprise Edition, Terminal Server Edition, and Workstation

Installing the Operating System

The following procedures highlight the Windows setup options that you must install to successfully prepare the operating system for the installation of the RAID Software Suite.

Note: For detailed Windows installation procedures, please consult the documentation that came with your computer system or operating system.

Install the operating system software *using one of the scenarios below* that matches your installation method.

Installing Windows with Installation Boot Diskettes

Booting from Windows installation diskettes initially to setup Windows.

1. Ensure that your computer is bootable from the floppy disk drive. Insert the first boot diskette and power up your system. Insert additional diskettes as required by on-screen instructions. This process will load the correct driver to access your non-bootable CD-ROM drive.
2. Go to step 2 of the following section.

Installing Windows Using the Bootable Windows CD-ROM

Note: If the driver for your disk drive controller is on the Windows CD-ROM, then follow prompts and then continue the installation at [Section 10.2, Installing and Launching StorCon](#).

If you are installing a driver that does not come with the Windows installation CD-ROM, for example, the IIR controller driver created in [Section 2.2](#), then follow the procedure below.



1. Insert CD-ROM and power up your system.
2. **If the drivers for your disk drive controller are not on the bootable Windows CD-ROM, Press *F6* as soon as the initial blue screen appears** to ensure that the driver diskette can be loaded.

Note: When installing Windows XP Professional, after having pressed F6, do not press F2 unless you are attempting an Automated System Recovery (ASR)

3. After installing the OS, continue the IIR controller installation at [Section 10.2, Installing and Launching StorCon](#).

4.1.4 Upgrading/Replacing Windows NT 4.0 Server Currently Installed on a Host Drive or Single Disk

4.1.4.1 Before you Begin

- If you are replacing an existing IIR controller with another, ensure that the OS is installed on an IIR controller that is compatible (see the accompanying Hardware Guide) with the new OS and/or RAID Software Suite that you are about to install. If it is compatible, then continue with [Section 4.1.4.2](#) to install Windows 2000 or [Section 4.1.4.3](#) to install Windows XP. If not, then exit this installation procedure.
- Windows NT4.0 Server is not 'upgradeable' to Windows XP Professional. The procedure described in [Section 4.1.4.3](#) will 'replace' the existing NT 4.0 Server installation.

Warning: Installation of Windows XP Professional using this procedure will overwrite all data on this host drive.

4.1.4.2 Upgrading Windows NT 4.0 to Windows 2000

Note: For hardware installation details, consult the accompanying Hardware Guide.

1. Before beginning, back up any vital data.
2. If you are not installing a new adapter and you are only upgrading the OS and the RAID software, go to [step 9](#).
3. If you are installing a new IIR controller, and transferring your OS to that new adapter, go to [step 4](#).
4. Power off your computer, disconnect all power cords, and remove the computer's cover to access the motherboard.
5. Disconnect the SCSI cable(s), if applicable.
6. Remove the currently installed IIR controller and insert the new IIR controller into the same slot.
7. Connect the SCSI cable, if applicable, to the newly installed IIR controller.
8. Replace the computer's cover, reconnect all power cords, and reboot the computer.
9. Log into NT with administrative user rights.

10. Insert the Windows 2000 CD-ROM. The Windows 2000 upgrade utility will auto-start. Click *Yes* to start the upgrade.
11. When *Welcome to the Windows 2000 Setup Wizard* launches, select *Upgrade to Windows 2000* and complete this portion of the upgrade. Windows should auto-reboot. If not, manually reboot the computer.
12. Leave the Windows 2000 CD-ROM in the CD-ROM drive and let the computer boot up. **DO NOT** touch any key when prompted to boot from the CD-ROM. Let the computer boot to the hard drive to continue the upgrade.
13. When the computer gets to the first blue setup screen, immediately *press the F6 key* to load the RAID drivers for Windows 2000.
14. When prompted press *S* and insert the IIR controller Installation diskette and continue the Windows 2000 upgrade.
15. Setup will complete the text-based portion of the installation and auto-reboot to continue the GUI portion of the Windows 2000 Upgrade.
16. When the GUI portion of setup completes, the computer will auto-reboot. If it does not auto-reboot, manually reboot the computer to continue the upgrade.
17. Go to [Section 4.1.5](#) to complete the upgrade.

4.1.4.3 Replacing existing Windows NT 4.0 with Windows XP Professional

Note: For hardware installation details, consult the accompanying Hardware Guide.

1. Before beginning, back up any vital data.

Warning: Installation of Windows XP Professional using this procedure will overwrite all data on this host drive.

2. If you are not installing a new adapter and you are only upgrading the OS and the RAID software, go to [step 9](#).
3. If you are installing a new IIR controller, and transferring your OS to that new adapter, go to [step 4](#).
4. Power off your computer, disconnect all power cords, and remove the computer's cover to access the motherboard.
5. Disconnect the SCSI cable(s), if applicable.
6. Remove the currently installed IIR controller and insert the new IIR controller into the same slot.
7. Connect the SCSI cable, if applicable, to the newly installed IIR controller.
8. Replace the computer's cover, reconnect all power cords, and reboot the computer.
9. Log into NT with administrative user rights.
10. Insert the Windows XP Professional CD-ROM. The Welcome to Windows XP wizard window appears. Click on *Install Windows XP* to start the installation.
11. A Windows Setup window will appear informing you that a Windows NT server to Windows XP 'upgrade' is not possible. Click on *OK* to continue.



12. A new Welcome to Windows Setup window appears. Ensure that Installation type is New Installation. Be sure to read and understand all the information provided in this window then click Next to continue.
13. Read and understand the license agreement then click on I accept this agreement. Click on Next to continue.
14. Enter the product license key as indicated and click on Next to continue.
15. The Setup Options window appears. Click on Next to accept defaults. The computer will now reboot.
16. Leave the Windows XP Professional CD-ROM in the CD-ROM drive and let the computer boot up. DO NOT touch any key if prompted to boot from the CD-ROM. Let the computer boot to the hard drive to continue the installation.
17. When the computer gets to the first blue setup screen, immediately press the F6 key to load the RAID drivers for Windows XP Professional. After having pressed F6, be sure NOT to press F2 when prompted.
18. When prompted press S and insert the IIR controller Installation diskette and press Enter indicate diskette is ready then press Enter again to select RAID Controller. When indicated, press Enter a third to continue Windows XP installation.
19. Follow on-screen prompts to complete the text-based portion of the installation and an auto-reboot will occur to continue the GUI portion of the Windows XP Professional installation. DO NOT touch any key if prompted to boot from the CD-ROM. Let the computer boot to the hard drive to continue the installation.
20. When the GUI portion of setup completes the computer will auto-reboot. If it does not auto-reboot, manually reboot the computer to continue the installation.
21. Go to [Section 4.1.5](#) to complete the installation.

4.1.5 Installation to an Existing OS

This section covers all installations of the IIR controller into computers with existing (previously installed) operating systems.

Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before continuing with the installation of the IIR controller to an existing OS.

4.1.5.1 Minimum Requirements

- Fully functional OS already installed and running on the computer.
- Administrative level privilege on the computer.
- Hard Disk Space: 9 MB Minimum
- Driver installation diskette
- Installed IIR controller. See the accompanying Hardware Guide for installation details.

Once all these requirements are met and you are logged on to the computer, continue to [Section 4.1.5.2](#).

4.1.5.2 Installing Drivers for your IIR Controller

Method 1 (Preferred)

Follow the instructions for installing the drivers, tools and utilities in [Section 10.2, Installing and Launching StorCon](#).

Method 2 (Alternative)

1. Insert the RAID Software Suite CD-ROM in CD-ROM drive.
2. DemoShield starts automatically. If DemoShield does not start automatically, then run the following file from the CD-ROM drive: <CD-ROM root>\autorun.exe
3. Click *OS Diskettes*, then click on *Windows*. Select the appropriate Windows version.
4. A command prompt window appears requesting that you insert a formatted floppy diskette.
5. Insert the floppy in the floppy drive and press Enter. The command prompt window closes automatically after the diskette has been written.
6. Use the OS to find the IIR controller and install its driver. Follow the instructions below for the applicable OS.

Windows 2000

- a. Open the Device Manager and scan the PCI bus for new hardware or hardware changes.
- b. Select the IIR controller in the 'hardware found' list, and then click *Next*.
- c. Select *Search for a suitable driver for my device*, and then click *Next*.
- d. Select *Floppy Drive*.
- e. Click on *Next* and follow the instructions up to and including system reboot.

Windows NT

- a. Open the Control Panel, SCSI Adapters.
- b. Click the *Drivers* tab and click the *Add* button.
- c. Insert the driver disk in the floppy drive.
- d. Click *Have Disk*. Navigate to the floppy drive and click *OK*.
- e. Select *RAID Controller* and click *OK*. Follow the instructions up to and including system reboot.

Windows XP Professional

- a. Open the Device Manager and scan the PCI bus for new hardware or hardware changes.
- b. Select the IIR controller in the 'hardware found' list, and then click *Next*. Note: If the IIR controller is the only new device found, the 'Found New Hardware Wizard' window will appear.
- c. Select 'Install from a list or specific location', and then click *Next*.
- d. Select 'Search removable media', then click *Next*



Note: As of this writing, this software package had not passed Windows Logo testing for Windows XP. However, certification is anticipated in the very near future. As a result, a window may appear notifying you about the Windows Logo testing compatibility. You can simply click on 'Continue Anyway' to complete your software installation.

- e. Click on Finish to complete your installation.
7. Go to [Section 10.2, *Installing and Launching StorCon*](#) to install the tools and utilities of the RAID Software Suite.

4.1.6 Swapping Out / Replacing Compatible IIR Controllers in Windows 2000 and Windows XP Professional

The procedure for replacing an IIR controller with another compatible but different model is different depending on where the operating system is installed. See [Section 4.1.6.1](#) if the operating system is installed on a host drive connected to the IIR controller or [Section 4.1.6.2](#) if the operating system is installed on an IDE drive connected to the motherboard.

For a list of compatible IIR controllers, see the Hardware Guide.

4.1.6.1 If OS Is on a Host Drive Connected to the IIR Controller

If Windows OS is installed to a host drive connected to the IIR controller, then replacing an IIR controller with another compatible but different model is similar to the procedure for adding a new controller. The important distinction is that you *add the new IIR controller into the system first*, before removing the old controller.

Caution: If you do not install the new host adapter first, it may result in a Windows OS boot failure.

To swap compatible IIR controllers, follow these steps:

1. Power down your computer.
2. Insert the new (compatible) IIR controller into an available PCI slot, leaving the existing IIR controller intact.
3. Power up your computer. Your Windows OS should load up as normal and detect the new IIR controller. Install the Windows OS driver if prompted to. If a driver install Wizard starts, follow the same driver installation procedures as in the User's Manual.
4. Reboot if prompted.
5. Once the new IIR controller is functioning properly, power down your computer.
6. Remove the old IIR controller (leave the new IIR controller in the slot that it was initially installed in and detected by your Windows OS) and move all desired devices to the new adapter.
7. All attached devices should be recognized upon reboot.

4.1.6.2 If OS is on an IDE Drive Connected to the Motherboard

If Windows OS is installed to an IDE drive connected to the motherboard, you have two options for replacing an IIR controller with another compatible but different model:

Option 1 (Recommended)

1. Uninstall the Raid Software Suite.
2. Shut down the system and replace the RAID controller.
3. Boot to Windows OS and follow the procedure for installing a Raid Controller to an existing operating system. See [Section 4.1.5](#).

Option 2

1. Shut down the system and replace RAID controller.
2. Boot to Windows OS.
3. When the Found New Hardware Wizard appears, follow the steps in the wizard and point it to the following locations when prompted:
 - c:\winnt\inf for inf file location
 - c:\winnt\system32\drivers for raidsrc.sys driver.

Note: 'winnt' may be substituted for 'windows' depending on how your OS was installed.

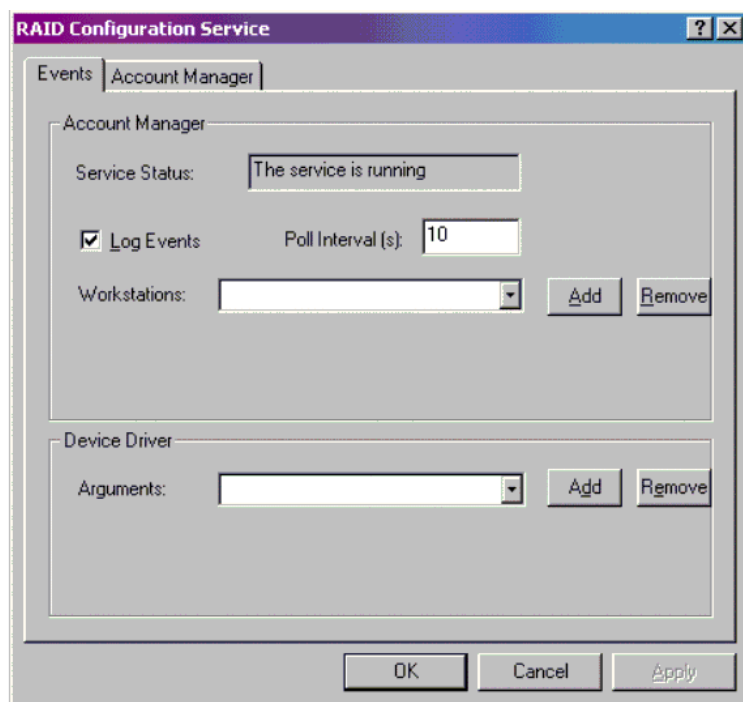
4.2 Configuring the RAID Configuration Service

The RAID Configuration Service (RCS) must be configured to allow for remote management of the RAID subsystem of your controller. The following steps describe how to configure the RCS.

1. Open the Control Panel on your Windows Desktop. Double-click the RAID Configuration Service icon.

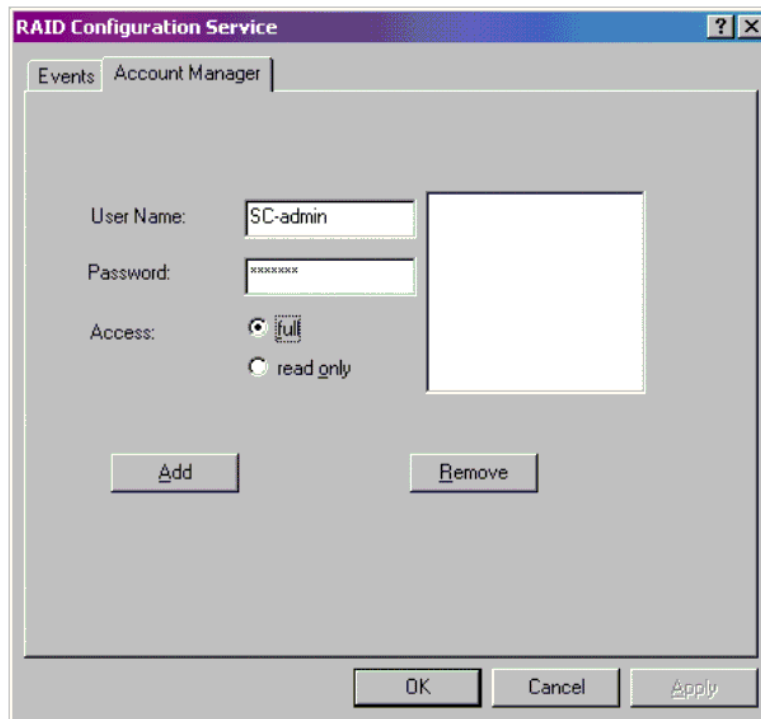
2. The RAID Configuration Service window appears. Click the Account Manager tab. See [Figure 4-31](#) below.

Figure 4-31. Access Account Manager



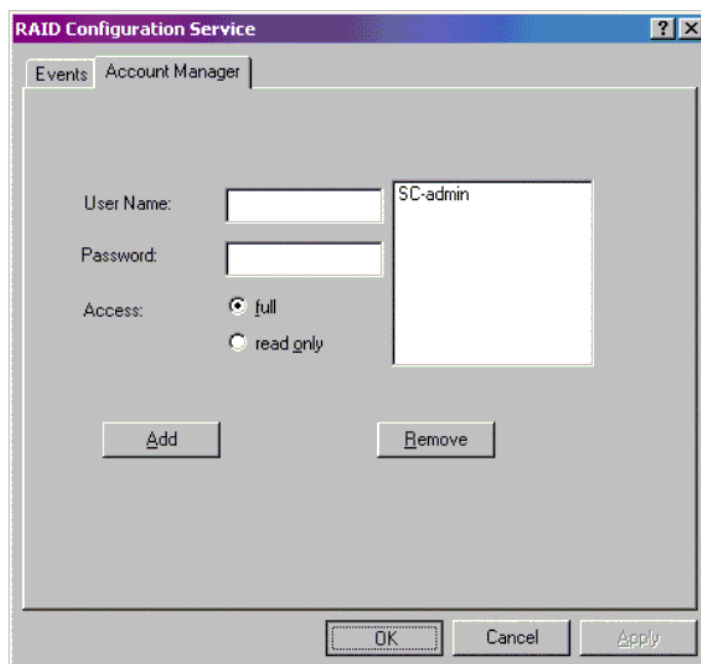
3. The Account Manager window displays. See [Figure 4-32](#) below.

Figure 4-32. Enter User Account and Password



4. Enter a user name and password. This will be the account used to manage the RAID subsystem remotely on this computer.
5. Click the 'full' Access radio button.
6. Click Add. Note that the account has been added to the list on the right side of the window. You can add additional accounts if desired, but at this point the configuration is complete.
7. Click OK to close the window and save changes. See [Figure 4-33](#).

Figure 4-33. Confirm User Account and Password



Installing Linux

5

This section discusses installation issues related to the Linux operating systems (SCO*, Debian*, DLD*, LST*, Red Hat* and SuSE*). For a successful installation, study the Linux system manuals thoroughly. The required drivers can be created from the RAID Software Suite CD-ROM.

5.1 Before you begin

Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before beginning the installation described in this chapter.

5.1.1 Linux Drivers and Updates

In some cases, you must make a driver diskette from the CD-ROM before you begin the Linux installation to a RAID drive. In other cases, you can use the driver provided by the Linux distributor to install the operating system and then update the driver to the latest version using the source code that is available on the CD-ROM. To determine which case applies to your operating system, see [Table 5-3](#) below.

Linux drivers and updates are available on the CD-ROM in the following location:

```
<CD>:\linux\dskimg\
```

Table 5-3. Driver Diskette or Driver Update

Linux Version	Make Driver Diskette Before Installation	Update Driver After Installation
Red Hat 6.2, 7.0, 7.1 and 7.2	Yes	No
SuSe 7.3 and 8.0	No	Yes
Mandrake 8.1 and 8.2	No	Yes
Caldera 3.1	Yes	No
Debian 2.2r3 and 2.2r6	Yes	No
TurboLinux 6.5 and 7.0	Yes	No

5.1.2 Available Drivers and Tools on the RAID Software Suite CD-ROM

gdth.tgz	IIR driver sources for Intel and alpha systems
StorCon-2.02.gz	StorCon for i386 systems, version 2.02
srcd-1.10-suse.tgz	Remote RAID Configuration Service, version 1.10, with start/stop script for SuSE Linux
srcd-1.10-redhat.tgz	Remote RAID Configuration Service, version 1.10, with start/stop script for Red Hat Linux

5.1.3 Assumptions About Path Names

Since the user may have received StorCon on the CD-ROM or as a download from the web, and because Linux administrators may mount volumes with a variety of names, certain assumptions were made in this document.

Table 5-4. Linux Path Names

Path Names	Note
/mnt/cdrom	If the Linux driver and StorCon is not being installed from the CD-ROM, the /mnt/cdrom part of the path may be changed to the proper directory
\$	Assumes this is your current directory level.
/dev/hda	Path entries such as the example on the right are assumptions and may be changed to match what the administrator has selected for the particular system.

5.2 General Installation Notes

5.2.1 Minimum Hardware Requirements

For detailed hardware requirements, specifications, and installation procedures specific to your IIR controller, consult the Hardware Guide for this adapter.

5.2.1.1 Computer System Requirements

- Computer with CD-ROM Drive (not attached to the IIR controller)
- One available PCI slot
- IIR controller
- PCI 2.2 compliant system BIOS
- SCSI hard disk drives (the minimum needed to meet desired RAID level requirements)

Note: If the IIR controller is configured with removable SDRAM, be sure that the DIMM is installed in the adapter prior to use. (*Ensure that the optional battery backup is disconnected during any installation or removal of the DIMM*). Not all adapters are configured with removable SDRAM or battery backup support. For installation details and applicability to your IIR controller, consult the Hardware Guide for this adapter.

5.2.1.2 Minimum Software Requirements

- RAID Software Suite CD-ROM
- 10 MB of hard disk space
- RAID Driver Installation Diskette for Linux (see [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions)
- Linux *Updates Diskette* (if required)
- Linux Kernel Support (open source)
- Linux Red Hat 7.x Installation CD-ROMs
- Root access on the Linux server

5.3 Installing Red Hat Linux 7.x on a Host Drive

To install Red Hat Linux 7.x on to a host drive, first create the appropriate driver disk from the RAID Software Suite CD-ROM. Follow the procedure below.

1. Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before beginning the OS installation.
2. Ensure the IIR controller is installed in your machine and is connected to drives on which you intend to create a host drive.
3. Boot your machine and when prompted press <Ctrl>+<G> to enter StorCon. Create a single host drive from your selected disks.

For more information on creating host drives using the StorCon, see [Section 10.4.1.1, Create New Host Drive](#).

Read the Red Hat documentation to understand the disk space/size requirements for the Red Hat 7.x installation.

Note: Refer to the Red Hat Installation Manual before proceeding.

4. Ensure that the system is set to boot from the CD-ROM drive and boot to the Red Hat 7.x CD-ROM. At the boot prompt type `linux dd`, or if you have an *updates diskette*, type `linux dd updates`. Press <Enter> to continue.

Note: An *updates diskette* is required for installation of Red Hat 7.2 to a RAID Host Drive.

5. The installer will prompt for a *driver disk*. Insert the driver diskette created in the previous procedure and press <Enter>. (To create a driver disk see [Section 2.2, Create the RAID Driver Installation Diskette](#)).
6. If you typed `linux dd updates` in [step 4](#), the installer will prompt you for an *updates diskette*. Insert the *updates diskette* and press <Enter>.

7. Follow onscreen instructions to complete your installation. Upon completion, remove the floppy diskette from the drive and reboot the system.

5.4 Installing an IIR Controller onto an Existing Linux Server

5.4.1 Installation of Driver Sources from the RAID Software Suite CD-ROM

The same procedure can be used for updating a currently installed IIR GDTH driver using the driver sources.

1. If you are installing the driver sources from the RAID Software Suite CD-ROM, and if InstallShield* has not started automatically, place the RAID Software Suite CD-ROM in the CD-ROM drive and use the following procedure:
 - a. Mount the CD-ROM by typing the following command:

```
$ mount /dev/cdrom /mnt/cdrom
```
 - b. Copy the driver sources to /usr/src/linux/drivers/scsi
 - c. Enter the following command:

```
$ cp /mnt/cdrom/linux/drivers/gdth.tgz /usr/src/linux/drivers/scsi**
```
 - d. Unpack and unzip the tar file using the following command:

```
$ tar -zxvf /usr/src/linux/drivers/scsi/gdth.tgz
```
- Note:** **Linux kernel versions are specific. For example, the directory /usr/src/linux-2.4.2 is specific to Linux kernel version 2.4.2 found in Red Hat version 7.1. You should be aware of the specific path for your distribution.
2. Compile a new kernel with module support and GDTH SCSI support enabled. This procedure depends on the Linux distribution. *make config*, *make dep*, *make clean* may be necessary to install the host drive. Refer to your specific Linux distribution documentation for help.
 3. Compile the modules. This procedure depends on the Linux distribution. Refer to your specific Linux distribution documentation for help.
 4. Configure *Lilo.conf* to use the new module support. This procedure depends on the Linux distribution. Refer to your specific Linux distribution documentation for help.

5.5 GDT Driver Parameters

5.5.1 Reservation of SCSI Devices

The reservation of SCSI devices becomes necessary if you want *Direct Access Devices* (for example, hard disks, removable hard disks like Iomega or SyQuest) to be directly controlled by Linux and not the IIR controller's firmware (for example, they are not configured as host drives).

Reservation of SCSI devices is also called *raw-service*. In this case the IIR controller does not cache the data to/from the reserved SCSI device. This reservation is important for removable hard disks. If they are controlled by the IIR controller and are a host drive, a media change is very difficult.

Non Direct Access Devices like CD-ROMs, Streamers, DATs, etc. do NOT require a reservation.

Important: The reservation of SCSI devices is only possible with not-initialized SCSI devices. (Use StorCon to de-initialize an already initialized device).

1. From driver version 1.10 on you can add the parameters for the reservation with the LILO append command:

Excerpt of /etc/lilo.conf:

```
# End LILO global section
# Linux bootable partition config begins
image = /boot/vmlinuz
root = /dev/sda2
label = Linux
append = "gdth=reserve_list:1,0,6,0"
# Linux bootable partition config ends
```

This gdth driver parameter reserves the SCSI device that is connected with IIR controller 1 (the second IIR controller), SCSI Bus 0 (channel A), ID 6, LUN 0 for Linux (raw service).

After each change in /etc/lilo.conf lilo must be loaded once.

Driver parameters may also be entered at the LILO boot prompt. (for example: gdth=reserve_list:1,0,6,0).

5.5.2 Further Driver Parameters

irq1,irq2, etc.	Only for RAID EISA controllers with disabled BIOS (irq1, irq2, etc. correspond with the IRQs of the RAID controllers)
disable:Y	deactivates the RAID driver
disable:N	activates the RAID driver
reserve_mode:0	reserves no SCSI devices [*1]
reserve_mode:1	reserves all not-initialized removable hard disk [*1]
reserve_mode:2	reserves all not-initialized SCSI devices [*1]
reserve_list:h,b,t,l,h,b,t,l,...	reserves SCSI devices at the corresponding coordinates with h=Hostadapter, b=SCSI Bus, t=Target ID, l=LUN
reverse_scan:Y	reversed scanning order of the PCI controllers
reverse_scan:N	Normal scanning order of PCI controllers according to the system BIOS
max_ids:x	x = number of target IDs per SCSI channel (accelerates the boot process)
rescan:Y	rescan all SCSI channels / Ids
rescan:N	scan only those SCSI devices found during system power up [*1]

- [*1] The driver parameters reserve_mode and rescan:N require IIR controllers with firmware version FW x.23.00 or higher.
- The current default settings of the driver are:
'gdth=disable:N,reserve_mode:1,reverse_scan:N,max_ids:127,rescan:N'
- If gdth is loaded as a module, these parameters can also be added with a special syntax.
- IRQ parameters are entered as 'IRQ=' (for example, IRQ=10). Several parameters are not separated with a comma (',') but a space (' '). All ':' are substituted with '=', all 'Y' with '1' and all 'N' with '0'.
- Default: 'modprobe gdth disable=0 reserve_mode=1 reverse_scan=0 max_ids=127 rescan=0'

5.6 Installation of StorCon Monitoring Utility

5.6.1 Installation of StorCon from the RAID Software Suite CD-ROM

1. If you are installing the StorCon from the RAID Software Suite CD-ROM, then place the RAID Software Suite CD-ROM in the CD-ROM drive and mount the CD-ROM:
\$ mount /dev/cdrom /mnt/cdrom

2. Copy the StorCon utility archive to /usr/sbin. Note that x.xx in these examples is the version of StorCon that was shipped on your software CD that matches the current Firmware.

```
$ cp /mnt/cdrom/linux/install/storcon-2.02.gz /usr/sbin/storcon-x.xx
```

3. Unpack the archive file and rename:

```
$ gunzip -d /usr/sbin/storcon-x.xx.gz
```

```
$ mv /usr/sbin/storcon-x.xx /usr/sbin/storcon
```

5.6.2 Using StorCon Monitoring Utility

To use StorCon a gdth driver version 1.26 or higher is required. To check the current gdth driver version type:

```
$ grep Driver /proc/scsi/gdth/0 (where 0 represents the controller number)
```

To run the StorCon utility, type 'StorCon' at any prompt. Select the interface (Linux if locally run, TCP/IP sockets if remote).

Note: While using StorCon from the Linux system console, the StorCon screen may be overwritten by system/kernel log messages. To avoid this, execute the following command (entered at the prompt from a console session):

```
dmesg -n 1
```

When finished using StorCon, the console log level can be set back to the default level using the following command:

```
dmesg -n 7
```

This behavior is not observed if the StorCon utility is used from an X-windows terminal window.

5.7 Remote Monitoring with the Intel SRCD Remote Access Service

sacd is the remote access service for IIR controllers. With *sacd* running, you can manage disk arrays from a remote workstation using storage management software (for example, StorCon) via TCP/IP.

Configure */etc/sacd.conf* to send SNMP traps or execute an external program (for example, mail) when a disk array controller event occurs. See comments in */etc/sacd.conf* for details.

5.7.1 SRCD Installation Instructions from the RAID Software Suite CD-ROM

1. Copy the `srcd` archive to `/etc` (may be `srcd-1.10-suse.tgz` or `srcd-1.10-redhat.tgz`)

```
$ cp /mnt/cdrom/linux/install/srcd-v.vv-xxxx.tgz /etc/srcd-v.vv-xxxx.tgz
```
2. Unpack `srcd-v.vv-xxxx.tgz`:

```
$ tar xvfz srcd-v.vv-xxxx.tgz
```
3. Run `install.sh`. It will interactively set up a start script and a file `/etc/srcd.conf`:

```
$ ./install.sh
```
4. Edit `/etc/srcd.conf` to send SNMP traps or execute an external program when controller events occur.
5. If `srcd` is not running, start it by executing one of the following commands:
 - For SuSE-Linux:

```
$ /sbin/init.d/srcd start
```
 - For RedHat-Linux:

```
$ /etc/rc.d/rc2.d/srcd start
```



Installing Novell NetWare

6

This section discusses installation issues related to the Novell NetWare operating system and covers versions NetWare 4.2x, NetWare 5.x and NetWare 6.x. For a successful installation, study the NetWare system manuals thoroughly. The information provided in this section refers to the loading of the IIR NetWare driver(s) only. The required drivers can be created from the RAID Software Suite CD-ROM.

6.1 Pre-Installation Requirements Checklist

This section identifies the minimum hardware and software required to successfully install the IIR controller and the accompanying RAID Software Suite. Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before beginning the installation described in this chapter.

6.1.1 Minimum Hardware Requirements

For detailed hardware requirements, specifications, and installation procedures specific to your IIR controller, consult the Hardware Guide.

6.1.1.1 Computer System Requirements

- Computer with CD-ROM Drive (not attached to the IIR controller)
- One available PCI slot
- IIR controller
- PCI 2.2 compliant system BIOS
- SCSI hard disk drives (the minimum needed to meet desired RAID level requirements)

Note: If the IIR controller is configured with removable SDRAM, be sure that the DIMM is installed in the adapter prior to use. (*Ensure that the optional battery backup is disconnected during any installation or removal of the DIMM*). Not all adapters are configured with removable SDRAM or battery backup support. For installation details and applicability to your IIR controller, consult the Hardware Guide.

6.1.2 Minimum Software Requirements

- RAID Software Suite CD-ROM
- 20 MB of free hard disk space
- RAID Software Suite Driver Installation Diskette for NetWare (see [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions).
 - One blank high density floppy diskette† may be required to create the installation diskette

- Novell NetWare 4.2x, 5.xx or 6.x software†

† Not supplied

6.2 New installation of NetWare 4.2x, 5.xx and 6.x

The following procedures assume that your IIR controller(s) is (are) already installed in your system. If you plan to install the OS to a host drive, you must first configure the host drive through the expansion ROM (XROM) version of Storage Console. At system boot time, press <Ctrl>+<G> when prompted to invoke the XROM version of Storage Console.

Note: Install all Novell patches and updates prior to installing the IIR controller driver and Storage Console. These updates can be found at <http://www.novell.com>.

6.2.1 New Installation of NetWare 4.20 with the SRCRX.HAM Driver

1. Create a driver diskette from the RAID Software Suite CD-ROM. See [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions.
2. Start the OS installation from the NetWare CD-ROM. (NetWare 4.2x CD-ROMs are NOT bootable so you must have a bootable DOS partition installed on your target hard drive and have the appropriate DOS driver for your CD-ROM.)
3. At the driver summary menu select *modify drivers*.
4. Insert the driver diskette into drive A:
5. Press <Enter> on the IIR driver list.
6. Press <Insert> in the IIR controller driver menu.
7. Press <F3> and change the path to A:\DRIVERS\4XX then press <Enter>.
8. Select the SRCRX.HAM driver and complete the installation.

Note: The above procedure will only install the device drivers for your controller. The IIR controller Tools Kit (Storage Console) is installed separately. See [Section 6.3.2](#) for details.

6.2.2 New Installation of NetWare 5.0 with the SRCRX.HAM Driver

Important: The SRCRX.HAM driver depends on a later version of the NWPA.NLM than was shipped on the NetWare 5.0 CD. Without the NWPA.NLM update, the SRCRX.HAM driver will fail to load. The following procedure will allow you to upgrade the NWPA.NLM on the fly during OS installation.

1. Create a driver diskette from the RAID Software Suite CD-ROM. See [Section 2.1](#) for details to create this disk.
2. Start the OS installation from the NetWare bootable CD-ROM.



3. The NetWare installation will eventually load a "Welcome" screen asking you to verify the startup directory (C:\NWSERVER).
4. Press <Alt>+<F10> to exit the installation.
5. At the NetWare console prompt, type "down" and press Enter (the installation exits to the boot drive's DOS prompt).
6. Insert the driver diskette into drive A:.
7. If your NetWare startup directory is drive C:, then run A:\INSTALL\NWUPDATE.BAT, otherwise create a subdirectory named NWUPDATE at the root of your boot drive and copy all the files from A:\DRIVERS\5XX to the NWUPDATE subdirectory.
8. Leave the NetWare 5.0 bootable CD in place, but remove the driver diskette from drive A:.
9. Reboot the server. After rebooting the server, the NetWare 5.0 Install will start again.
10. Right after the Accept the License Agreement screen, select the "Continue with Existing Partition" option.

Note: If you chose to install a "New Server," you may encounter the following warning dialog box:

"Warning: A previously installed version of NetWare was detected in C:\NWSERVER. If you choose to install a new server, all data on the existing server will be lost. <Press ENTER to continue>"

If the warning dialog box appears, press Enter.

11. Complete the installation.

Note: The above procedure will only install the device drivers for your controller. The IIR controller Tools Kit (Storage Console) is installed separately. See [Section 6.3.2](#) for details.

6.2.3 New Installation of NetWare 5.1x with the SRCRX.HAM Driver

1. Create a driver diskette from the RAID Software Suite CD-ROM. See [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions.
2. Start the OS installation from the NetWare bootable CD-ROM.
3. At the storage driver summary menu select *modify drivers*.
4. Insert the driver diskette into drive A:
5. Press <Enter> on the storage adapter list.
6. Press <Insert> twice from the storage controller driver menu.
7. Press <F3> and change the path to A:\DRIVERS\5XX then press <Enter>.
8. Select the SRCRX.HAM driver.
9. Complete the installation.

Note: The above procedure will only install the device drivers for your controller. The IIR controller Tools Kit (Storage Console) is installed separately. See [Section 6.3.2](#) for details.

6.2.4 New Installation of NetWare 6.x with the SRCRX.HAM Driver

1. Start the OS installation from the NetWare bootable CD-ROM. The SRCRX.HAM driver is on the NetWare 6.x CD and is installed automatically if a RAID controller is detected.
2. After installing the operating system, install all patches and updates from Novell and update the SRCRX.HAM driver. For information on updating the SCSRX.HAM driver, see [Section 6.3](#).

Note: The above procedure will only install the device drivers for your controller. The IIR controller Tools Kit (Storage Console) is installed separately. See [Section 6.3.2](#) for details.

6.3 Adding Drivers and/or Storage Console to an existing NetWare Installation

The following procedures assume that the IIR controller(s) is (are) already installed in your system.

Install all Novell patches and updates prior to installing the IIR controller driver and Storage Console. These updates can be found at <http://www.novell.com>.

1. Create a driver diskette from the RAID Software Suite CD-ROM. See [Section 2.2](#), *Create the RAID Driver Installation Diskette* for instructions.
2. Power on the system and boot to the OS.
3. Load the Netware Configuration Options tool:
 - NetWare 4.2x—Load INSTALL.NLM.
 - NetWare 5.x and above—Load NWCONFIG.NLM.
4. Insert the driver diskette into drive A:
5. Complete [Section 6.3.1](#) and/or [Section 6.3.2](#) to install your desired packages.
 - NetWare 4.2x and 5.xx—Complete [Section 6.3.2](#) to install the IIR Controller Tools Kit Package. You do not need to reinstall the driver package if you initially installed the driver from a driver diskette that you created from the CD.
 - NetWare 6.x—Complete [Section 6.3.1](#) to update the SRCRX.HAM driver that was installed from the NetWare 6.x CD and complete [Section 6.3.2](#) to install the IIR Controller Tools Kit Package.

6.3.1 Installing the IIR Driver Package

1. Select *Product options*, then *Install a product not listed*.



2. Change the path to A:\INSTALL and press <Enter> to continue.
3. Select *Storage RAID Controller Driver (SRCRX.HAM)* by setting the cursor on its menu item and pressing the space bar (an X will appear in the item's check box).
4. Press <F10> to accept the selected item.
5. After the file copy is complete, select *Return to previous menu* to get back to the INSTALL/NWCONFIG main options
6. Select *Driver Options*.
7. Select *Configure disk and storage device drivers*.
8. Select *Discover and load additional drivers*.
9. Press Enter to continue past any module load errors not related to the IIR controller.
10. Press <F3> to continue past any non-IIR controller related hardware found by NetWare for which a matching driver was not found.
11. NetWare will now load the SRCRX.HAM driver for each hardware instance you added in the system and update the STARTUP.NCF file so the driver will load for each subsequent restart of the server.
12. Select *Return to previous menu* twice to get back to the INSTALL/NWCONFIG main options.

6.3.2 Installing the IIR Controller Tools Kit Package

Note: StorCon.NLM will not find any controllers unless SRCRX.HAM is already loaded and running.

1. Select *Product options*, then *Install a product not listed*.
2. Press F3 to change the path to A:\INSTALL and press <Enter> to continue.
3. Select *Storage RAID Controller Tools Kit (StorCon.NLM)* by setting the cursor on its menu item and pressing the space bar (an X will appear in the item's check box).
4. Press <F10> to accept the selected item.
NetWare will copy the necessary files, automatically load StorCon.NLM, and modify the AUTOEXEC.NCF file to load StorCon.NLM for each subsequent restart of the server.
5. Exit the Configuration Options tool.

6.3.2.1 Configuring Tools for Remote Access

1. Create a group SRC_Operator in the NDS.
2. Add the Admin and all other users who will use this interface.
3. Load SRCIPX.NLM.
4. Start Storage Console (StorCon.exe) or Storage Console Plus (StorCon+.exe) from a workstation using a user name of the group SRC_Operator and his/her NetWare password.

6.4 ASPI Support for NetWare 4.2x, 5.x

You will need to ensure that the file NWASPI.CDM is in the server's search path. For NetWare 4.2, NWASPI.CDM is already located in the server's startup directory (C:\NWSERVER) so no action is required. For NetWare 5.x, copy NWASPI.CDM into the server's startup directory from C:\NWSERVER\DRIVERS.

Note: Since the debut of Media Manager (MM.NLM) and the NetWare Peripheral Architecture (NWP.A.NLM), the need for ASPI in NetWare is rare. However, there may be a few applications that require ASPI. Unless your application(s) require it, do not install ASPI.

This procedure describes how to manually install Novell's ASPI manager module, but be aware that you may need to follow specific instructions from your application vendor to correctly configure ASPI.

1. With the server loaded and running, load INSTALL.NLM (NetWare 4.2x) or NWCONFIG.NLM (NetWare 5.x).
2. Select *NCF Files Option* from the main menu.
3. Select *Edit Startup.ncf*.
4. Add the following line at the end of the .CDM section of STARTUP.NCF:
5. LOAD NWASPI.CDM
6. Reboot the server.

6.5 Tips and Tricks

6.5.1 Optimize Data Throughput

High performance RAID controllers are designed for multi-I/O operations and are capable of processing several I/Os simultaneously. Cache controllers with powerful on-board RISC CPUs can handle many I/Os per second. NetWare offers the option of adjusting the number of write I/Os which are loaded on the mass storage subsystem. To gain optimum performance and speed from modern high performance disk controllers, the amount of the so-called *maximum concurrent disk cache writes* has been increased with every further development of NetWare. Looking back to NetWare 3.11, only 100 *concurrent disk cache writes* were possible. With NetWare 4.10, it can be as much as 1000.

The number of concurrent disk cache writes delivering the best performance is highly dependent on the performance of the installed disk controller, the amount of cache RAM on the controller and the hard disks. The IIR controllers can easily cope with up to 500 simultaneous requests. The following command line enables the adjustment of a new number under NetWare (default value = 50):

```
set maximum concurrent disk cache writes = xxxx
```

where xxxx represents the required number of concurrent disk cache writes.



6.5.2 'Cache Memory Allocator Out of Available Memory' in PCI-ISA Systems

PCI systems which are not equipped with an EISA Bus behave in the same way as an ISA mainboard with regard to the available RAM memory. NetWare therefore does not automatically recognize the available memory above 16 MByte. The command `register memory` allows the registration of memory above 16 MByte. Memory shortage can appear while loading several applications simultaneously on the server, especially where large volumes are concerned. This is because the register memory command is normally carried out in the `autoexec.ncf` file. This is usually located in the SYS volume. An `autoexec.ncf` file placed in the DOS partition of the NetWare Server helps to get around this problem. To carry out this process, the disk driver must be removed from the `startup.ncf` and inserted into the `autoexec.ncf` in the DOS partition. After completing this process, the disk driver must be loaded directly after the register memory command as indicated in the following `autoexec.ncf` file example.

```
register memory 1000000 1000000

LOAD C:SRCRP312

....
```

An additional start file can be loaded on the SYS volume for differentiation, for example, with the name '`autonet.ncf`'.

6.5.3 Installing NetWare 4.1 - Wrong Drive Name

The following problem often occurs when installing NetWare 4.1 server. While copying the module `cdrom.nlm`, the system hangs. This problem only occur when the CD-ROM drive's name under the OS from which it is copied is '`cdrom`'. For example, the `config.sys`/`autoexec.bat` contains the following files:

```
DEVICE=aspicd.sys /D:cdrom
```

and

```
mcsdex /D:cdrom
```

To avoid this problem, change the CD-ROM's OS name to another name. For example, use

```
/D:scsacd' instead of '/D:cdrom
```

6.5.4 NetWare-Server Not Stable When Under High Utilization

High server utilization combined with a large number of applications running on the server can lead to an increase in the number of *dirty cache buffers* resulting in an unstable server. To avoid this situation, modify the following parameters.

- Increase the number of concurrent disk cache writes for the disk subsystem. Set maximum concurrent disk cache writes. This parameter can be increased up to 500 for high performance controllers and fast hard disks.
- Decrease the delayed write standard parameter. Set dirty disk cache delay time. This parameter sets the time where *dirty buffers* are written (flushed) from the cache of NetWare to the hard disk. The minimum value is 0.8 seconds. Care should be taken not to go below 0.8 seconds because this value influences server performance substantially.

6.5.5 IIR and Non-ASPI Compatible Controllers

If an IIR controller is operated under NetWare together with another controller/host adapter which does not support the ASPI standard, SCSI raw devices cannot be operated on both controllers (tapes, CD-ROMs).

In general, NetWare gives preference to controllers which support the ASPI Standard (for example, IIR controllers, Adaptec*). As soon as `aspitrn.dsk` is loaded (auto-loading module) tapes and CD-ROMs on the ASPI non-compatible controller are no longer recognized. To avoid this problem, the file `aspitrn.dsk` can be deactivated via a modification.

To deactivate `aspitrn.dsk`, find the string 'ASPI_Entry' by using a Disk-Monitor in `aspitrn.dsk` (please pay attention to upper case letters etc). Modify the string by replacing 'A' with an 'X' (for example, 'XSPI_Entry'). The modified `aspitrn.dsk` enables the operation of raw devices on non-ASPI-compatible controllers.

Note: After this modification, no other raw devices (tapes, CD-ROMs) are recognized on the IIR controller or Adaptec.

6.5.6 Last Status Information

All IIR controllers temporarily store the status information from all hard disks that are connected to that controller. This information can be useful when searching for possible causes of disk failures or interferences. The last status information consists of a hexadecimal, 8 digit number and can be displayed via the StorCon or saved in a Save Information ASCII file. The information is temporarily available in the IIR controller's RAM. Therefore, it is important to check this information before switching off and before carrying out a Reset if a disk failure has occurred or if interference was present. The last status information is divided into controller-specific and SCSI-specific messages. A detailed description can be found in the file `laststat.pdf`.

6.5.7 Adding Additional Capacity after an Online Capacity Expansion

The additional capacity resulting from an online capacity expansion of an existing array drive is introduced to the system as a new host drive. To be able to make use of the new capacity without having to down the server, type "scan for new devices" on the server console to recognize the new capacity. Use *Install* to build new partitions and volumes.



6.6 Notes on ARCserve

Make sure that you always have the latest version of your ARCserve software.

The back-up program ARCserve can be used in connection with the IIR controller. The communication between the tape device (for example, DAT, DLT) and the IIR controller takes place through the ASPI interface. For this purpose, the IIR ASPI Manager `aspitrn.dsk` is needed. When loading the regular IIR NetWare driver (for example, `srcrp311.dsk`), the ASPI Manager is automatically loaded, too. During the installation of ARCserve, choose Adaptec ASPI Manager as the interface.

Installing SCO UnixWare

7

This section discusses installation issues related to the SCO UnixWare operating systems (UnixWare 7.1.1 and UnixWare 8.0). For a successful installation, study the SCO system manuals thoroughly. The required drivers can be created from the RAID Software Suite CD-ROM.

7.1 General Installation Notes

This section identifies the minimum hardware and software required to successfully install the IIR controller with the accompanying RAID Software Suite. Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before beginning the installation described in this chapter.

7.1.1 Minimum Hardware Requirements

For detailed hardware requirements, specifications, and installation procedures specific to your IIR controller, consult the Hardware Guide.

7.1.1.1 Computer System Requirements

- Computer with CD-ROM Drive (not attached to the IIR controller)
- One available PCI slot
- IIR controller
- PCI 2.2 compliant system BIOS
- SCSI hard disk drives (the minimum needed to meet desired RAID level requirements)

Note: If the IIR controller is configured with removable SDRAM, be sure that the DIMM is installed in the adapter prior to use. (*Ensure that the optional battery backup is disconnected during any installation or removal of the DIMM*). Not all adapters are configured with removable SDRAM or battery backup support. For installation details and applicability to your IIR controller, consult the Hardware Guide.

7.1.2 Minimum Software Requirements

- RAID Software Suite CD-ROM
- 20 MB of free hard disk space
- RAID Software Suite Driver Installation diskette for UnixWare (see [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions).
 - One blank high density floppy diskette† may be required to create the installation diskette
- SCO UnixWare 7.1.1 or 8.0† OS software



† Not supplied

7.2 Installing the IIR Controller as Boot Controller

There must be a host drive on the first IIR controller found during a cold boot. In addition, the IIR BIOS must be enabled and the SCSI ID of the corresponding IIR SCSI channel must be set to 7.

To begin the installation

1. Boot the system with the first UnixWare boot disk or CD. The operating system scans the system for host adapters.
2. When requested insert the *UnixWare HBA-Disk*.
3. Follow the installation as described in the SCO documentation.

Note: The assignment of an IRQ to an INT is made by the PCI System BIOS. UnixWare versions 2.x and higher automatically recognize the IRQ of a PCI expansion card.

7.3 Installing the IIR Controller as an Additional Controller

Two cases are discussed below.

7.3.1 No IIR Controller Has Yet Been Configured

In this case, the IIR driver must be installed from the *UnixWare HBA-Disk* by means of the UnixWare desktop and the options “System Setup”, “Application Setup”. Alternatively, this procedure can be carried out from the UnixWare shell: “*pkgadd -d /dev/dsk/f0t*” (IIR driver disk in drive 0).

7.3.2 An IIR Controller Has Already Been Configured

This procedure is different depending on the operating system:

If using UnixWare 7.11

In this case, you only have to add an additional entry for the new IIR controller. This is carried out by the command

```
/etc/scsi/pdiadd -d DRQ -v IRQ -m MEM srch
```

For DRQ use 0 (not necessary for PCI boards). For IRQ write the IRQ number that IIR controller uses. MEM corresponds to the DPMEM address of the IIR controller (which is displayed in the BIOS message of the IIR controller after power up). In both cases, you have to carry out a cold boot to use the new IIR controller under UnixWare.

Example: `/etc/scsi/pdiadd -d 0 -v 12 -m c8000 srch.`

Then reboot the UnixWare system. No kernel link is required because the driver will be dynamically loaded.

If using UnixWare 8.0

UnixWare 8.0 automatically detects the new device at startup, reboots the system and links the driver.

7.4 Installing an Operating System onto a Host Drive or Single Disk

Note: When installing UnixWare, create only one RAID device (host drive) on which the operating system is to be installed.

1. Create and configure *one* RAID device from the BIOS of Storage Console (accessed by pressing <Ctrl>+<G>).
2. Insert UnixWare installation diskette 1 of 2 which was included with your OS user's manual. Installation begins.

During the installation UnixWare prompts you to insert a Host Bus Adapter (HBA) diskette. Insert the RAID Software Suite Driver Installation diskette. If you do not have the diskette for the operating system that you are installing, then create it before continuing. See [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions.

3. **This step does not apply to UnixWare 8.0.** During the installation of UnixWare, you will be prompted to install the Network Information Services (NIS) package. By default the installation will configure your system as an NIS client. See your system administrator for configuration of the NIS services.



Note: Installation of this service may take an extended period of time.

If you do not plan on using the NIS or there is not an NIS server present on your network that you are installing this system onto, defer installation of NIS at this time by pressing <F8> at the NIS configuration screen.

4. After completing the OS installation, proceed to [Section 7.5](#) to complete the installation.

7.5 Hardware Identifiers of SCSI Devices

7.5.1 Host adapter Number (HA)

The host adapter number assigned to the IIR controller is derived from the PCI slot number of the IIR controller. Therefore, if there is only one IIR controller installed in the PCI bus computer system, the host adapter number is 0. If there are two IIR controllers installed, the IIR controller with the lower PCI Slot number is assigned host adapter number 0 and the IIR controller with the higher PCI slot number is assigned host adapter 1.

Note: After a cold boot, the IIR BIOS displays a couple of messages, each beginning with the controller's PCI slot number, for example, "[PCI 0/3] 4 MB RAM detected". The number after the '/' is the slot number of the controller. This will help determine the order of the IIR controllers and which host adapter number is assigned to them by UnixWare.

7.5.2 Bus Number, Target ID and LUN

Target IDs and LUNs for "**Non-Direct Access Devices**" (devices like streamers, tapes and CD-ROMs and therefore not configurable via StorCon), are directly assigned to the SCSI ID and the channel of the IIR controller. Host drives are assigned to the SCSI ID by their Host Drive number on a virtual channel. This virtual channel is added to the physical channels. On a 2-channel controller the bus number of this channel is 2.

7.5.2.1 Configuration Example (1st channel = 0, 2nd = 1, virtual =2)

In the PCI computer are two IIR controllers (HA 0 = 1st IIR controller, HA 1 = 2nd IIR controller), each with two SCSI channels.

1 hard disk	as host drive no. 0 on HA0
1 hard disk	as host drive no. 0 on HA1
1 hard disk	as host drive no. 1 on HA1
1 Streamer	SCSI ID 2, LUN 0 on SCSI channel A of HA0
1 CD-ROM	SCSI ID 3, LUN 0 on SCSI channel B of HA0
1 DAT	SCSI ID 2, LUN 0 on SCSI channel A of HA1

The resulting HA, Bus, Target ID and LUN are indicated in [Table 7-5](#).

Table 7-5. Bus Number, Target ID and LUN

HA	Bus	Target ID	LUN	Device
0	2	0	0	1 st hard disk, host drive no. 0 (boot drive)
0	0	2	0	Streamer
0	1	3	0	CD-ROM
1	2	0	0	hard disk, host drive no. 0
1	2	1	0	hard disk, host drive no. 1
1	0	2	0	DAT
1	2	2	0	hard disk, host drive no.2

7.6 Additional Information

- After creating a new Host Drive use `/sbin/sdiadd` to rescan the SCSI bus and to recognize the new drive. Then you can use `diskadd` utility to partition the drive and create the file system. To add a second drive, `diskadd` can be run with the following command line:

```
/etc/diskadd -F s5dm 1
```

To determine the parameters for `diskadd`, run `/sbin/sdiconfig -l` which will produce output similar to:

```
0:0,7,0: HBA : (srch,1) SRC SCSI
0,3,0: HBA : nStor nexStor 8Le 1.030020
1,7,0: HBA : (srch,1) SRC SCSI
2,0,0: DRIVE : Host Drive #00          equal to c0b2t0d0
2,4,0: DRIVE : Host Drive #04          equal to c0b2t4d0
1:0,2,0: HBA : (ide,1) Generic IDE/ATAPI
0,0,0: CDROM : LITEON CD-ROM LTN483 BL1F
```

To run `diskadd` on a host drive, find the corresponding "Disk Name" of the host drive to be mounted. For example, to mount Host Drive #00, the command would be `/etc/diskadd c0b2t0d0`.

- When using Direct Access Devices with **exchangeable media** (for example, removable hard disks) that are not reserved for the raw service, media has to be inserted either when the system is booted, or with StorCon (mount/unmount). Otherwise the device will not be available under UnixWare.
- The IIR UnixWare driver supports *Direct Access Devices* (for example, hard disks, removable hard disks) as SCSI-raw devices. This is especially important if you use removable hard disks which you want to exchange with other controllers. How to reserve a device for the SCSI-raw service is described in the file `space.c` on the IIR HBA disk (example and documentation).
- Multi-processor support: The IIR device drivers for UnixWare support multi-processor systems.

7.7 Host Drive Removal

When removing disks in UnixWare, the operating system may need to change the indices and system disk names assigned to the remaining disks. To safely remove a host drive from a UnixWare system, clean up the "ghost names" that are created when disk indices are changed by following the procedure below (for more information about "ghost names", refer to the UnixWare man page for `sdghost`).

Note: Use `/sbin/sdiconfig -l` to determine the host drive (Host Drive #00) to system disk name (c0b0t0d0) mapping.

1. Unmount all directories of the host drive to be removed (for example, `umount /dev/dsk/c0b2t0d0s1`).
2. Run the `diskrm` system utility to permanently remove the mount entries of the host drive to be removed (for example, `/etc/diskrm c0b2t0d0`).
3. Remove the host drive through StorCon. Refer to [Section 10.4.1.3, Host Drive Screen](#) for further details.
4. Reboot the system.
5. Run `srcghostrm` - this will remove any existing ghost names (using `/sbin/sdghost -r`) and fix mount points for the remaining host drives (by editing `/etc/vfstab`).
6. Reboot the system again.

Because UnixWare may modify system disk names after removing a host drive, if you have modified system files besides `/etc/vfstab` which use system disk names corresponding to host drives, you will need to run `sdiconfig -l` to determine the new names for those host drives.

Installing SCO OpenServer

8

This section discusses installation issues related to the SCO OpenServer operating systems (OpenServer). For a successful installation, study the OpenServer system manuals thoroughly. The required drivers can be created from the RAID Software Suite CD-ROM.

8.1 General Installation Notes

This section identifies the minimum hardware and software required to successfully install the IIR controller and the accompanying RAID Software Suite. Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before beginning the installation described in this chapter.

8.1.1 Minimum Hardware Requirements

For detailed hardware requirements, specifications, and installation procedures specific to your IIR controller, consult the Hardware Guide.

8.1.1.1 Computer System Requirements

- Computer with CD-ROM Drive (not attached to the IIR controller)
- One available PCI slot
- IIR controller
- PCI 2.2 compliant system BIOS
- SCSI hard disk drives (the minimum needed to meet desired RAID level requirements)

Note: If the IIR controller is configured with removable SDRAM, be sure that the DIMM is installed in the adapter prior to use. (*Ensure that the optional battery backup is disconnected during any installation or removal of the DIMM*). Not all adapters are configured with removable SDRAM or battery backup support. For installation details and applicability to your IIR controller, consult the Hardware Guide.

8.1.2 Minimum Software Requirements

- RAID Software Suite CD-ROM
- RAID Driver Installation Diskette for OpenServer (see [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions).
- OpenServer OS software† (including floppy disks, HBA disk, and documentation).

† Not supplied

8.1.3 Additional Installation Notes

The *boot drive* is the drive which is first integrated at system power up. For the IIR controller, this drive is the first host drive in the list of IIR host drives, for example, the host drive number 0 (see StorCon menu *Configure Host-Drives*). During the installation you will have the opportunity to decide if you want the IIR controller to make the boot drive available, or whether you want to operate the IIR controller as an additional controller in the computer system.

If the IIR controller is the only hard disk controller in the computer system, it automatically makes the boot drive available. If there are more hard disk controllers, the controller which makes the first drive available (the drive containing partition C:) is the boot controller.

OpenServer is always installed on the hard disk with Target ID 0 and LUN 0 on host adapter 0, that is on host drive 0 of this controller. If OpenServer is installed from tape (streamer), the streamer must have SCSI ID 2 and be connected with SCSI channel A of host adapter 0. For an installation from CD-ROM, the CD-ROM device must have SCSI ID 5 and be connected with channel A of the IIR controller.

When using OpenServer, you have the option to link the driver to the kernel before starting the kernel (*btld* (ADM)). This will allow you to use the IIR controller as the only controller in the system. Use the IIR *HBA Disk*. During the installation, whenever the N1 floppy disk is inserted and the message

```
Boot
:
```

is displayed, *do not* press Enter immediately, but type in *link* Enter. The system will then prompt you for the name of the HBA driver. Now type in *srch*. It may be necessary to type in the complete boot string. In this case, you have to add the following command:

```
link=srch HBA=fd(xx)
```

where *xx* is the "Minor Device Number" of the corresponding device file. *xx* = 60 for fd0135ds18, 3.5" floppy as A:, or *xx* = 61 for fd1135ds18, 3.5" floppy as B: (see OpenServer system Administrator's Reference, Hardware Dependence, floppy devices). When requested, enter the IRQ which has been assigned to the PCI INT of the IIR controller (see the Hardware Guide). In addition, the IIR BIOS must not be disabled and the boot drive must be connected with the IIR controller having the lowest PCI slot number.

When the UNIX installation has been completed, the driver is installed. Additional devices may be installed with *mkdev hd* (ADM). If the IIR controller is an additional controller, the installation of the driver is carried out with *installpkg*.

8.1.4 Installing OpenServer on a System with Multiple SCSI or RAID Controllers

When installing to a system that has multiple SCSI/RAID controllers, you should install Openserver on a RAID volume that is controlled by the first SCSI/RAID controller that is enumerated during the server BIOS boot.

8.1.5 Installing an Operating System onto a Host Drive or Single Disk

1. Enter link at *boot:* prompt
2. Insert the IIR RAID Driver Installation Diskette in the floppy drive.
3. When prompted by the system, enter *srch*.
4. Follow the on-screen instructions to complete this portion of the installation.
5. Continue to [Section 8.1.6](#).

8.1.6 Installing an OS onto an IDE or SCSI Disk Drive not Attached to the IIR Controller

1. Install the package by using *installpkg*. The system will display the packages available on the floppy disk. Select *srch* to begin the installation.
2. Execute the command */etc/conf/bin/idbuild* to start the kernel rebuild. Select *Y* for all options.
3. Restart the system when prompted.
4. When in the graphical mode of the OS, execute the following commands before running Storage Console:


```
cd /usr/lib/terminfo
tic src386.src
TERM=src386
export TERM
```

Note: The above commands are not needed when in full screen, text mode of the OS.

5. To get the SCSI, LUN and Target ID's, run the command */etc/srcscan*
6. Create a hard drive by executing the command *mkdev hd*. Make a note of output for [step 7](#).
7. Execute the command *srch* and use the information obtained in [step 6](#).
8. Format the drive by using the following command: *mkfs /dev/dsk/1s0*

Note: Drives are named per this format: */dev/dsk/1s0*

9. The volume is ready to use and can now be mounted.

8.2 Instructions on mkdev (ADM) for 3.2v4.x

When the program *mkdev hd* (ADM) is started, you will be asked for the coordinates of the device you wish to install. The driver does not automatically display all devices connected, so after the installation you will find a tool named *SRCSCAN* in the directory / etc. Scanning can take up to several seconds, especially when there is more than one controller in the system. The devices are displayed together with their host adapter number, target ID and LUN. These values are used in *mkdev* (ADM). How the HA-no., target ID and LUN are determined are discussed in [Section 8.2.1](#) through [Section 8.2.3](#).

Note: The UNIX driver always maps the first detected host drive with target ID 0, LUN 0. This drive is used as a boot drive when the IIR controller makes the boot drive available.

8.2.1 Host adapter Number (HA)

The host adapter number assigned to the IIR controller is derived from the controller's PCI slot number. Therefore, if there is only one IIR controller installed in the PCI bus computer system, the host adapter number is 0. If there are two IIR controllers installed, the IIR controller with the lower PCI slot number is assigned host adapter number 0 and the IIR controller with the higher PCI slot number is assigned host adapter number 1.

Note: After a cold boot, the IIR BIOS displays a couple of messages, each beginning with the controller's PCI slot number. For example, "[PCI 0/3] 4 MB RAM detected". The number after the '/' is the slot number of the controller. This will help determine the order of the IIR controllers and which host adapter number is assigned to them by UNIX. See the *Hardware Installation and User's Guide*.

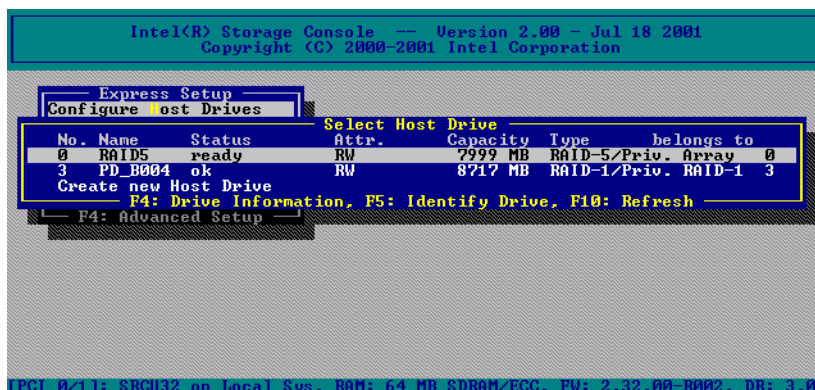
8.2.2 UNIX Target ID and LUN

Target IDs 0 and 1 with LUN 0 to 7 are reserved for *Direct Access Devices* (devices behaving like a hard disk or a removable hard disk and therefore configurable with StorCon). There is a correlation between the host drive number StorCon assigns (menu *Configure Host Drives*), and the assigned target ID and LUN:

$$\text{Host-Drive Number} = 8 * \text{Target ID} + \text{LUN}$$

The host drive number is the number the drive is given in the list of available host drives in the StorCon program. [Figure 8-34](#) displays a list of host drives. In this example, there are two host drives installed. The first host drive has target ID 0 / LUN 0 and the second target ID 0 / LUN 1.

Figure 8-34. Host Drive Number



The formula for determining target ID and LUN from the existing host drive numbers yields the following possible combinations for *Direct Access Devices*. See [Table 8-6](#).

Table 8-6. UNIX Target ID and LUN

Host Drive Number	Target ID	LUN	Host Drive Number	Target ID	LUN
0	0	0	8	1	0
1	0	1	9	1	1
2	0	2	10	1	2
3	0	3	11	1	3
4	0	4	12	1	4
5	0	5	13	1	5
6	0	6	14	1	6
7	0	7	15	1	7

This conversion (as indicated in [Table 8-6](#)) is necessary because the single SCSI devices are not declared to the host operating system in the order of their SCSI IDs but according to the host drive numbers in StorCon. Host drives are a prerequisite for the IIR controller to be able to link several SCSI devices together to form a higher structure (for example, RAID 5).

The sequence of the single host drives can be changed easily by having StorCon sort them in its *Configure Host Drives* menu. In this way, it is also possible to change the boot drive. (It had previously been selected as boot drive because it has the lowest drive number, that is, 0, and is therefore the first drive to be communicated to the system.)

Target ID and LUN of *Non-Direct Access Devices* (devices such as streamers, tapes, CD-ROMs, etc., not configurable with StorCon) are determined on the basis of the SCSI ID and the SCSI channel used by the IIR controller. These devices can only be configured with SCSI IDs 2 to 6. SCSI ID 0 and 1 are reserved for hard disks, SCSI ID 7 for the IIR controller. If *Non-Direct Access Devices* are configured on SCSI ID 0 or 1, they are not

recognized during the scanning process and therefore can not be used. The Target IDs of *Non-Direct Access Device* are identical to their SCSI ID, the LUN depends on the SCSI channel used (LUN 0 for SCSI channel A and LUN 4 for SCSI channel B).

Note: After a cold boot the IIR BIOS displays all connected devices with their physical coordinates, for example, SCSI ID and SCSI LUN.

Having to determine the Target ID and LUN in such a complicated manner might seem rather awkward. However, it is necessary to do so because the IIR controllers have more than one SCSI channel, whereas UNIX can only manage host adapters with one SCSI channel. Therefore, the IIR UNIX driver has to make the appropriate transformations.

Table 8-7. SCSI ID, SCSI Channel, Target ID and UNIX LUN

SCSI ID of Non-Direct Access Devices	Used IIR SCSI Channel	UNIX Target ID	UNIX LUN
2	A	2	0
3	A	3	0
4	A	4	0
5	A	5	0
6	A	6	0
2	B	2	4
3	B	3	4
4	B	4	4
5	B	5	4
6	B	6	4

8.2.3 Configuration Example

In this example, the PCI computer has two IIR controllers (HA 0 = 1st IIR controller, HA 1 = 2nd IIR controller), each with two SCSI channels. See the information below. The resulting HA, Target ID and LUN are indicated in [Table 8-8](#).

1 hard disk	as host drive no. 0 on HA0
1 hard disk	as host drive no. 0 on HA1
1 hard disk	as host drive no. 1 on HA1
1 Streamer	SCSI ID 2, LUN 0 on SCSI channel A of HA0
1 CD-ROM	SCSI ID 3, LUN 0 on SCSI channel A of HA0
1 DAT	SCSI ID 2, LUN 0 on SCSI channel B of HA1

Table 8-8. Configuration Example

HA	Target ID	LUN	Device
0	0	0	1 st hard disk, host drive no. 0 (boot- and installation drive)
0	2	0	Streamer
0	3	0	CD-ROM
1	0	0	hard disk, host drive no. 0
1	0	1	hard disk, host drive no. 1
1	2	4	DAT

8.3 Instructions on mkdev (ADM) for 3.2v5.x (Open Server)

When the program *mkdev hd* (ADM) is started, you will be asked for the coordinates of the device you wish to install. The driver does not automatically display all devices connected, so after the installation you will find a tool named SRCSCAN in the directory */etc* to display all devices. The scanning can take up to several seconds, especially when there is more than one controller in the system. The devices are displayed together with their host adapter number, target ID and LUN. These values are used in *mkdev* (ADM). How the HA-no., target ID and LUN are determined are discussed in [Section 8.3.1](#) through [Section 8.3.3](#). Note that the UNIX driver always maps the first detected host drive with target ID 0, LUN 0. This drive is used as a boot drive when the IIR controller is to make the boot drive available. As an alternative to the following *new* mapping method of OpenServer, you may also use the *old* mapping. To enable the old mapping, make the following change in */etc/conf/pack.d/srch/space.c* file:

```
srch_mapping=1 into srch_mapping=0
```

8.3.1 Host adapter Number (HA)

The host adapter number assigned to the IIR controller is derived from the controller's PCI slot number. Therefore, if there is only one IIR controller installed in the PCI bus computer system, the host adapter number is 0. If there are two IIR controllers installed, the IIR controller with the lower PCI slot number is assigned host adapter number 0 and the IIR controller with the higher PCI slot number is assigned host adapter 1. (Note: After a cold boot, the IIR BIOS displays a couple of messages, each beginning with the controller's PCI slot number, for example, "[PCI 0/3] 4 MB RAM detected". The number after the '/' is the slot number of the controller. This will help determine the order of the IIR controllers and which host adapter number is assigned to them by UNIX. See the Hardware Guide for more details.

8.3.2 UNIX Target ID and LUN

Target IDs and LUNs for *Non-Direct Access Devices* (devices like streamers, tapes and CD-ROMs and, therefore, not configurable via StorCon), are directly assigned to the SCSI ID and the channel of the IIR controller. Host drives are assigned in increasing order to the free coordinates (bus number and target ID, LUN is always 0).

8.3.3 Configuration Example

In this example, the PCI computer has two IIR controllers (HA 0 = 1st IIR controller, HA 1 = 2nd IIR controller), each with two SCSI channels. See the information below. The resulting HA, Bus, Target ID and LUN are indicated in [Table 8-9](#).

1 Hard Disk	as host drive no. 0 on HA0
1 Hard Disk	as host drive no. 0 on HA1
1 Hard Disk	as host drive no. 1 on HA1
1 Streamer	SCSI ID 2, LUN 0 on SCSI Channel A of HA0
1 CD-ROM	SCSI ID 3, LUN 0 on SCSI Channel B of HA0
1 DAT	SCSI ID 2, LUN 0 on SCSI Channel A of HA1

Table 8-9. UNIX Target ID and LUN

HA	Bus	Target ID	LUN	Device
0	0	0	0	1 st Hard Disk, host drive no. 0 (boot drive)
0	0	2	0	Streamer
0	1	3	0	CD-ROM
1	0	0	0	Hard Disk, host drive no. 0
1	0	1	0	Hard Disk, host drive no. 1
1	0	2	0	DAT
1	0	3	0	Hard Disk, host drive no.2

Caution: *Non-Direct Access Devices* must not be connected to Bus 0, Target ID 0, LUN 0. This is reserved for the boot device under OpenServer.

8.4 Additional Information

- From version 4.x of OpenServer, a media change can be made with the UNIX commands MOUNT and UNMOUNT. Ensure that the removable hard disk keeps its StorCon drive number when changing the media, otherwise a separate ID/LUN entry is necessary for each single media (since the drive number depends on the media and not the device containing it).
- OpenServer and later versions support a maximum of 4 IIR controllers in one computer system.

- The tool RAIDSYNC in the directory '/etc' carries out a UNIX SYNC command (update super block) and causes all buffers still present in IIR controller's cache to be written to the logical drives. It is advisable to use this tool before shutting down the system.
- When using *Direct Access Devices* with *exchangeable media* (for example, removable hard disks), a media has to be inserted when the system is booted, otherwise the device is not available under UNIX.
- *Non-Direct Access Devices* (streamer, tapes, CD-ROMs, etc) can be switched on even after system power up. They will still be recognized by SRCSCAN.

Installing Berkeley UNIX FreeBSD

9

This section discusses installation issues related to the FreeBSD operating systems (version 4.3 and higher). For a successful installation, study the Berkeley UNIX FreeBSD system manuals thoroughly. The required drivers can be created from the RAID Software Suite CD-ROM.

9.1 General Installation Notes

This section identifies the minimum hardware and software required to successfully install the IIR controller and the accompanying RAID Software Suite. Ensure that you have completed the steps described in [Chapter 2, “Getting Started,”](#) before beginning the installation described in this chapter.

9.1.1 Minimum Hardware Requirements

For detailed hardware requirements, specifications, and installation procedures specific to your IIR controller, consult the Hardware Guide.

9.1.1.1 Computer System Requirements

- Computer with CD-ROM Drive (not attached to the IIR controller)
- One available PCI slot
- IIR controller
- PCI 2.2 compliant system BIOS
- SCSI hard disk drives (the minimum needed to meet desired RAID level requirements)

Note: If the IIR controller is configured with removable SDRAM, ensure that the DIMM is installed in the adapter prior to use. (*Ensure that the optional battery backup is disconnected during any installation or removal of the DIMM*). Not all adapters are configured with removable SDRAM or battery backup support. For installation details and applicability to your IIR controller, consult the Hardware Guide.

9.1.2 Minimum Software Requirements

- RAID Software Suite CD-ROM
- 2 MB of hard disk space
- RAID Driver Installation Diskette for FreeBSD
- Berkeley UNIX FreeBSD* 4.3 software† (for new OS installations)

† Not supplied

9.2 Installing an Operating System onto a Host Drive or Single Disk

1. Create the FreeBSD driver installation diskette (see [Section 2.2, Create the RAID Driver Installation Diskette](#) for instructions) or copy the files from the freebsd/drivers/ directory on the RAID Software Suite CD-ROM to a floppy disk.
2. Configure your RAID system using the Storage Console utility at BIOS post time (press <Ctrl>+<G> when prompted; refer to [Chapter 10, “Storage Console,”](#) for more details). Note that the FreeBSD driver supports up to 34 host drives, but only 1 drive is required for FreeBSD.
3. Boot from the FreeBSD installation CD-ROM. When the following message appears
“Hit [Enter] to boot immediately, or any other key for command prompt.
Booting [kernel] in x seconds...”
press any key, and the *ok* prompt is displayed. Insert the FreeBSD driver floppy and type “load kernel” to load the kernel and “load disk1:iir” to load the IIR driver from floppy disk (disk0 is the CD-ROM (floppy emulation), disk1 the first Floppy (DOS Format)). Type “boot” to boot the kernel.
4. Remove the CD-ROM and floppy from the drives and reboot. When you boot from the host drive you must interrupt the boot process as in [step 3](#) above. Re-insert the FreeBSD driver floppy and load the driver. The command is “load disk0:iir” (5.0-CURRENT: “load disk0:iir2”) since there is no CD-ROM in the drive and the disk0 becomes the floppy. Type “boot” to continue the boot process.
5. Install the driver package.
 - a. Copy file iir-1.1.tgz from the floppy, for example (DOS-Format):

```
mount -t msdos /dev/fd0 /mnt
cp /mnt/iir-1.1.tgz /tmp/iir-1.1.tgz
umount /mnt
```
 - b. Install the package using the command:

```
pkg_add /tmp/iir-1.1.tgz
```
6. Reboot. From now on the driver is loaded automatically as a module. The OS version of StorCon is also installed.

9.3 Installing an OS onto an IDE or SCSI Disk Drive not Attached to the IIR Controller

Follow the installation instructions in [Section 9.2](#). When the installation is completed, power off the system. Insert the IIR controller into any available PCI slot. Reboot and continue the installation procedure outlined in [Section 9.4](#).

9.4 IIR Controller Installation in an Already Configured FreeBSD System

In the event you are adding an IIR controller to a pre-existing FreeBSD system, ensure that the newly created host drives are detected after existing disks attached to the operating system (most particularly, the disk containing the root file system). Due to the device numbering in Unix-based kernels (in this case FreeBSD), failure to do so may render the system unbootable. Possible solutions to this issue may include one of the following procedures:

1. Ensure that the IIR driver loads after the other SCSI drivers have loaded. This can be accomplished by performing one of the following steps:
 - a. Compile the IIR driver as a Kernel module and specify the load time in the /boot/loader.rc configuration file
 - a. Manually load and unload the IIR Kernel Module using utilities like "kldload" and "kldunload" after the system has booted.
2. Modify system configuration files like /etc/fstab. To do so you will need to know explicit device filenames associated with all the disks in the system.

The exact procedure used will depend on your particular system configuration. Please refer to your FreeBSD documentation before changing any system configuration.

9.4.1 Installation Procedure

1. Install the driver package.
 - a. Copy file iir-1.1.tgz from the driver floppy, for example, (DOS-Format):

```
mount -t msdos /dev/fd0 /mnt
cp /mnt/iir-1.1.tgz /tmp/iir-1.1.tgz
umount /mnt
```
 - b. Install package using the command:

```
pkg_add /tmp/iir-1.1.tgz
```
2. Reboot. From now on the driver is loaded automatically as a module. The OS version of StorCon is also installed.
3. Run the StorCon utility to configure your RAID devices (refer to [Chapter 10, "Storage Console,"](#) for more details).
4. Follow the vendor supplied documentation to partition, format and mount your RAID host drives.

9.4.2 Un-installation Procedure

1. Unmount the host drive(s) using the following command:



```
umount \ 'device path'
```

2. Uninstall the driver package using the command:

```
pkg_delete iir-1.1
```



Storage Console

10

The Storage Console (StorCon) is a full-featured monitoring and configuration utility with a text-based user interface. StorCon manages all aspects of the RAID subsystem as well as many features of the RAID adapter.

There are two methods for running the StorCon program. As part of the IIR controller's expansion ROM, it can be loaded at system boot level by pressing <Ctrl>+<G> when prompted. StorCon can also be launched as an application within a host OS.

Storage Console Plus (StorCon+) is a graphical user interface implementation of StorCon. StorCon+ has similar features and functionality to StorCon, with few exceptions. However, StorCon+ runs on Microsoft Windows-based systems only. More information on StorCon+ can be found in [Chapter 11, "Storage Console Plus"](#).

10.1 StorCon Features

StorCon features include

- diagnosis and configuration functions
- online capacity expansion of disk arrays
- host drives which can be setup and configured under normal operation
- monitoring functions which indicate the performance of the various components, cache statistics
- enhanced repair functions for disk arrays with failed drives

StorCon is

- available for NetWare 4.2x/5.x/6.x Windows NT, Windows 2000, Linux, SCO UnixWare, SCO OpenServer, and Berkeley UNIX FreeBSD
- loadable locally (on the server) or remotely from an authorized workstation (support of various protocols)
- available as both an executable program under various operating systems, and a ROM-resident program loadable with <Ctrl>+<G> at system boot level (for example, without an OS)

Note: Some features are only available from the expansion ROM (XROM) version of StorCon to prevent user from experiencing unrecoverable events.

10.2 Installing and Launching StorCon

The StorCon program is available for various operating systems (NetWare 4.2x/5.x/6.x, Windows NT, Windows 2000, Linux, SCO UnixWare, SCO OpenServer, and Berkeley UNIX FreeBSD). It can be used either locally or remotely. All IIR controllers in a network can be monitored and serviced from one or several workstation(s).

10.2.1 Launching the StorCon Program Under NetWare

The StorCon program for NetWare is part of the RAID Software Suite CD-ROM. There are two methods of installing StorCon.

- Launching StorCon on the file server
- Launching StorCon on an authorized workstation (remote)

Launching StorCon Launching on a File server

Note: The NetWare driver for the IIR controller and the auto-loading module CTRLTRAN must have been previously loaded on the file server. Use the following command to load StorCon:

```
LOAD StorCon Enter
```

Installing StorCon on a Workstation

Note: The NetWare driver for the IIR controller the auto-loading module CTRLTRAN and module CTRLIPX.NLM must have been previously loaded on the file server console. This module searches for a file named CTRLIPX.CFG. This file must be located in the same directory as CTRLIPX.NLM. Additionally, the system administrator must set up a user group named IIR_OPERATOR. All users belonging to this group are given access (through StorCon) to the IIR controller(s) in this specific file server (Access level 0).

Load the StorCon program from one (or more) workstation(s) using the following command:

```
StorCon Enter
```

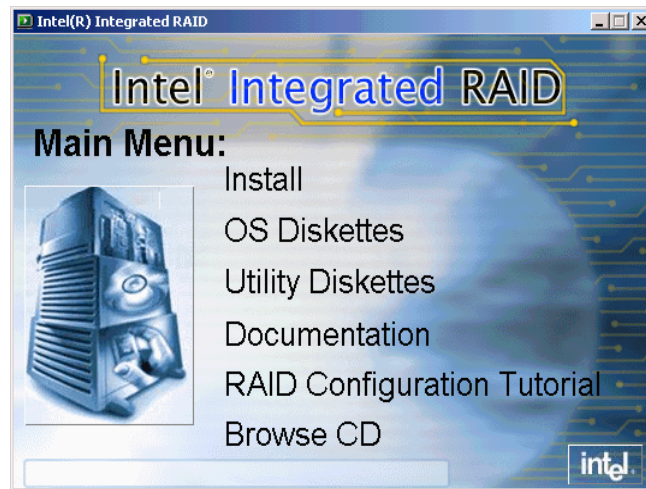
10.2.2 Installing and Launching the StorCon Program Under Windows NT/2000/XP Professional

1. Ensure that Windows has been configured to meet all the requirements of the RAID Software Suite setup.
2. If the IIR controller has not been installed into the computer, then install it before continuing. Consult the Hardware Guide for details when installing the IIR controller. After the controller has been installed, go to [step 3](#).
3. Log into Windows using a user account with administrative rights.
4. Insert the RAID Software Suite CD-ROM in the CD-ROM drive. When the Intel® Integrated RAID splash screen (see [Figure 10-35](#)) appears, click on the link *Install*, to launch the *Setup* program.

Note: If the RAID Software Setup Splash Screen does not appear, then run the setup.exe file that resides at:

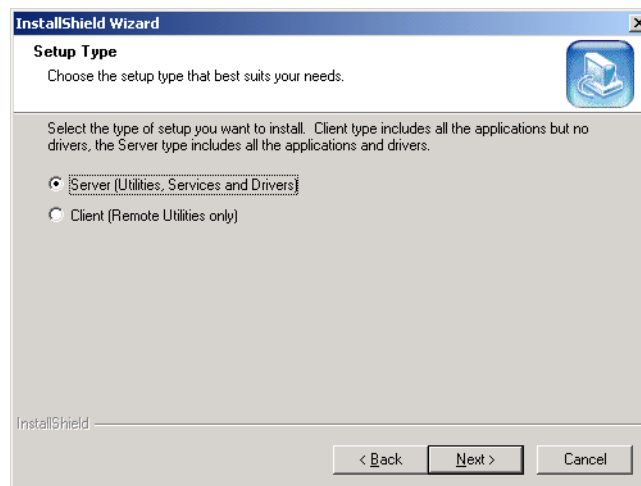
```
<CD-ROM root>\windows\install\setup.exe
```

Figure 10-35. Intel® Integrated RAID Splash Screen



5. A welcome screen appears. Click *Next*.
6. License Agreement - Click *Yes* after reading to agree.
7. Setup Type - Select one of the following for Local or Remote administration of the IIR controller (see [Figure 10-36](#)) and click *Next*:
 - Server (Utilities, Services and Drivers)
This option allows for local administration of the IIR controller.
 - Client (Remote Utilities only)
This option allows for remote administration of the IIR controller.

Figure 10-36. Setup Type



8. Choose the default selections (recommended) or select components that you wish to install. Click *Next* to continue the installation.

9. Choose the Destination Location - Use the default directory for installation, click *Next*.
10. Select the Program Folder - Use default Program Group, click *Next*.
11. After the file copy completes click *Finish* to complete the installation. It is recommended that you restart the computer after you install the device drivers.

Note: As of this writing, this software package had not passed Windows Logo testing for Windows XP. However, certification is anticipated in the very near future. As a result, a window may appear notifying you about the Windows Logo testing compatibility. You can simply click on Yes when prompted to continue your installation.

This completes the installation procedure for Windows.

10.2.3 Installing and Launching StorCon Under Linux

The RAID Software Suite CD-ROM for Linux includes the following archive:
StorCon.tgz StorCon and object files (Intel)

This archive includes all object files to create StorCon, as well as an executable StorCon compiled on a current Linux version.

Load StorCon by typing the following at the prompt:

```
<CD-ROM root>/linux/install/StorCon Enter
```

Note: To monitor the server(s) remotely using StorCon, load MON4SOCK.DLL in the same directory as StorCon. This DLL supports SPX/IPX and TCP/IP network protocols (for NetBIOS you can load instead MON4NETB.DLL).

Note: While using StorCon from the Linux system console, the StorCon screen may be overwritten by system/kernel log messages. To avoid this, execute the following command (entered at the prompt from a console session):

```
dmesg -n 1
```

When finished using StorCon, the console log level can be set back to the default level using the following command:

```
dmesg -n 7
```

This behavior is not observed if the StorCon utility is used from an X-windows terminal window.

10.2.4 Launching StorCon Under OpenServer

To use the StorCon program under OpenServer (2.x, 4.x and 5.x), substitute the standard terminal entry for a new one:

```
cd /usr/lib/terminfo Enter  
tic src386.src Enter
```

Before each loading of StorCon, activate the terminal:

```
TERM = src386 Enter  
export TERM Enter
```

These two lines inserted in the **.profile** file are automatically processed during each login. The StorCon program itself is copied during the OpenServer installation into the */etc* directory. StorCon is launched by entering:

```
StorCon Enter
```

Note: To monitor the server(s) remotely using StorCon, load MON4SOCK.DLL in the same directory as StorCon. This DLL supports SPX/IPX and TCP/IP network protocols (for NetBIOS you can load instead MON4NETB.DLL).

10.2.5 Launching StorCon Under UnixWare

Launch StorCon by typing the following at the prompt:

```
StorCon Enter
```

Note: To monitor the server(s) remotely using StorCon, load MON4SOCK.DLL in the same directory as StorCon. This DLL supports SPX/IPX and TCP/IP network protocols (for NetBIOS you can load instead MON4NETB.DLL).

A host drive must exist to run StorCon under UnixWare. If no host drive currently exists, reboot the system, create a host drive via XROM StorCon and boot into UnixWare to run the OS version of StorCon. Refer to [Section 10.4.1.1](#) for instructions to creating a host drive.

10.2.6 Launching StorCon Under FreeBSD

Launch StorCon by typing the following at the prompt:

```
StorCon Enter
```

Note: To monitor the server(s) remotely using StorCon, load MON4SOCK.DLL in the same directory as StorCon. This DLL supports SPX/IPX and TCP/IP network protocols (for NetBIOS you can load instead MON4NETB.DLL).

10.2.7 Un-installing the RAID Software Suite

Warning: Un-installing the RAID Software Suite from a computer that has the operating system installed on a host drive or pass-through disk will result in the inability to reboot the operating system. This could result in data loss.

To remove the RAID Software Suite from Windows 2000 follow the instructions below.

1. Ensure that you have closed all applications and are logged in with administrative rights.

2. Open *Control Panel* and launch the *Add/Remove programs* icon.
3. Select the RAID Software Suite and click *Change/Remove* for Windows 2000 or *Add/Remove* for Windows NT.
4. The InstallShield Wizard begins.

Windows 2000

- a. Select the *Remove* option, click *Next*.
- b. A progress window appears as files are removed.
Note: The RAID device driver will not be removed. Only the RAID software components will be removed.
- c. When finished, a window titled *Maintenance Complete* appears. Click *Finish* to complete the removal of the RAID software components.

Windows NT 4.0

- a. Select the *Modify* option, click *Next*.
- b. The *Select Components* screen will launch. Remove the check from the check box in front of each component that you wish to remove. Do not remove the check from the check box in front of the RAID Device Drivers component unless you intend to remove the device drivers.
Note: *If you remove the device drivers and you are booting to a host drive, you will be unable to reboot back into Windows. The operating system will be inaccessible.*

Click *Next*.

- c. A *Question Box* will appear if you have deselected the Storage Consoles. Click *Yes* to continue the uninstall.
 - d. A window titled *InstallShield Wizard Complete* will appear. Click *Finish* to close the window.
5. After file removal finishes, reboot the computer to complete the uninstall.

10.3 The StorCon Program

StorCon is a software utility for configuring and diagnosing RAID subsystems built on IIR controllers. StorCon configures the RAID subsystem into four drive levels of hierarchy:

Physical Devices	Level 1 (lowest level)
Logical Drives	Level 2
Array Drives	Level 3
Host Drives	Level 4

A drive of a given level of hierarchy is composed of the drive(s) of the next lower level. The OS recognizes only host drives, with the lower drive levels completely transparent to it. For more information about drive levels, see [Section 1.3.6, Levels of Drive Hierarchy Within the Intel® Integrated RAID Firmware](#).

Table 10-10 lists the host drive types that StorCon can configure.

Table 10-10. Host Drive Types

Type of Host Drive	Description of Host Drive	Minimum Number of Hard Disks Required
Disk	1:1 assignment: host drive to hard disk (sometimes also called JBOD)	1
Chain	Concatenation of several hard disks	2
RAID 1	Mirroring	2
RAID 0	Data Striping	2
RAID 4	Data Striping with parity drive	3
RAID 5	Data Striping with striped parity	3
RAID 10	Combined RAID 0 and 1	4

StorCon can run in one of two methods:

- By pressing <Ctrl>+<G> at system boot time
- By launching the application from within an OS

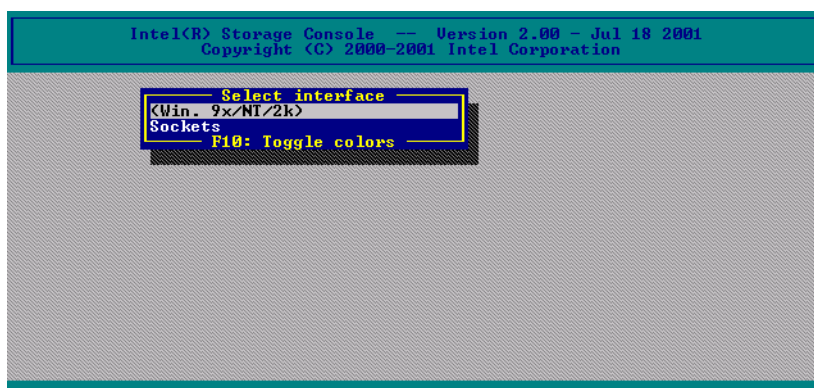
After launching StorCon, navigate within the application in the following ways:

- Use the up arrow and down arrow keys, or type a (highlighted) character when applicable, to select an item.
- Press the <Enter> key to accept a selection
- Press the <Esc> key to return to a previous menu or exit StorCon

After launching the OS version of StorCon, the screen in Figure 10-37 appears.

After launching the XROM version of StorCon, the Select Controller screen (Figure 10-39) appears. Refer to Section 10.3.2 for more details about the Select Controller screen.

Figure 10-37. Select Interface



10.3.1 Select Interface

Interface represents the way in which the OS version of StorCon connects with the IIR controller. In this example “Win. 9x/NT/2k” (see [Figure 10-37](#)) indicates that the StorCon is the Windows version and is loaded on a Windows system. If you press Enter, StorCon scans the local system for IIR controllers.

Selecting “Sockets” allows for the remote connection of this workstation with servers using IIR controllers. Select TCP/IP or IPX/SPX network protocols. To access the servers with IIR controllers, the corresponding remote service must be loaded on the server. Users must be assigned access rights (Name, password). See [Figure 10-38](#). After selecting “Sockets” and “TCP/IP” you may enter the IP address of the server (if you choose “SPX/IPX” StorCon will scan the network for suitable servers which have SPX/IPX protocol). Enter user name and password as appropriate.

Figure 10-38. Remote Machine



In the Select Interface screen, you can press <F10> to toggle between a black and white or color display.

10.3.2 Select Controller

StorCon displays a list of IIR controllers which are installed in the server (in this example one SRCU32, see [Figure 10-39](#)). This list includes the controller number, the controller name, the PCI Bus system (0=primary, 1=secondary, etc.) and the PCI slot number, the controller's features (C=Chaining, 0=RAID 0, 1=RAID 1, 4=RAID 4, 5=RAID 5, 10=RAID 10) and the firmware level.

Press <Enter> to select a controller. Subsequent changes to settings within StorCon affect the selected controller and the connected devices.

Figure 10-39. Select Controller

Select Controller					
No.	Name	Position	Features	Firmware	
0	SRCU32	IPCI 0/1	C 0 1 4 5 10	2.32.00-R002	
F10: Toggle Colors					

10.3.3 Express Setup / Advanced Setup and Monitor Menus

After you select an IIR controller from the Select Controller screen (see [Figure 10-39](#)), StorCon initially displays the Express Setup and Monitor menus (see [Figure 10-40](#)). Express Setup has simple configuration functions and Monitor has monitoring functions.

For expanded configuration functions, press <F4> to switch to the Advanced Setup and Monitor menus (see [Figure 10-41](#)). You can toggle between the Express Setup and Advanced Setup menus by pressing <F4>.

Figure 10-40. Express Setup and Monitor Menus

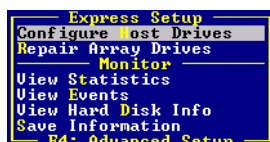
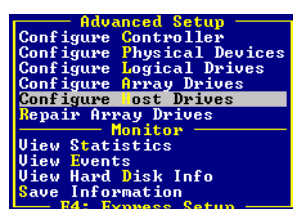


Figure 10-41. Advanced Setup and Monitor Menus



Menu options can be selected either with the cursor up/down keys, or by pressing the key matching the highlighted character.

10.4 Express Setup

Express Setup has the following menu options. See [Figure 10-40](#).

- *Configure Host Drives* - to configure already existing host drives or create new ones. For example, you can create a new host drive under normal operation without shutting down the computer.
- *Repair Array Drives* - to repair array drives which have failed drives.

Below the Express Setup menu is the Monitor menu (see [Section 10.6, Monitor Menu](#) for more information).

10.4.1 Configure Host Drives

The Express Setup menu option, *Configure Host Drives*, allows for easy installation of new host drives and modifications to existing host drives.

This menu option is similar to the *Configure Host Drives* option in Advanced Setup (see [Section 10.5.5](#)). Unlike Advanced Setup, Express Setup does not allow the user to select a stripe size; instead, Express Setup defaults the stripe size to 128KB. Also, Express Setup does not have the *Split Host Drive*, *Merge Host Drives* or *Partition Drive* menu options.

Note: Creation of a host drive as Single Disk, RAID 0, RAID 1 or RAID 10 is non-destructive so that the partition table of the new drive (which could have conceivably been used on

another SCSI host bus adapter) could have valid data. To prevent this from occurring, run a surface check on each disk before creating hosts.

Note: The XROM version of StorCon may report an error incorrectly after configuring more than 30 host drives. This false error is indicated by one of the following messages:

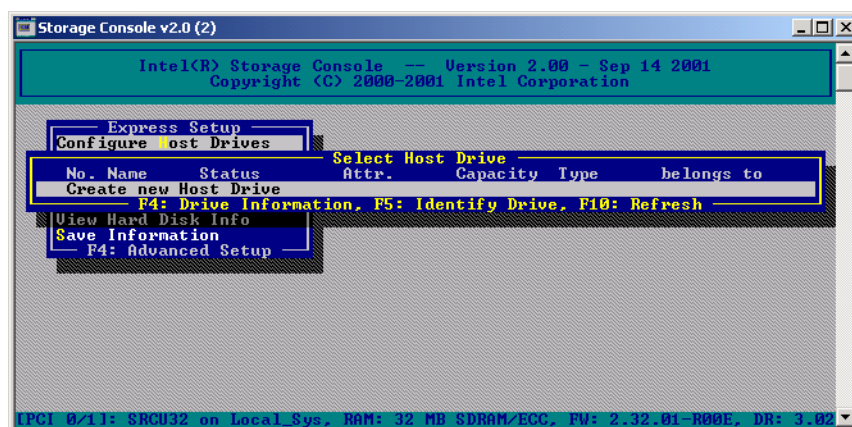
- No more handles
- Memory allocation failed

After the system boots into the operating system, however, StorCon shows that all of the host drives exist. This limitation does not occur when configuring more than 30 host drives with the OS version of StorCon.

10.4.1.1 Create New Host Drive

From the Express Setup menu, select *Configure Host Drives* and press Enter to display a list of existing host drives, if any, in the Select Host Drive screen (Figure 10-42). For an unconfigured system, no host drive entries are displayed.

Figure 10-42. Select Host Drive Screen

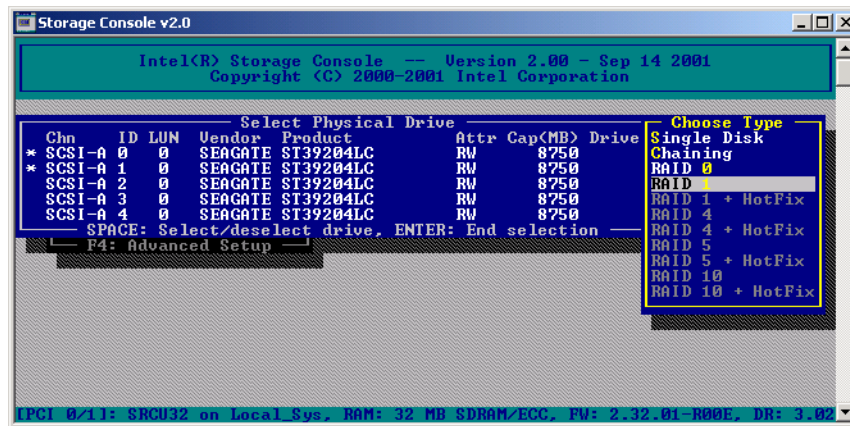


In the Select Host Drive screen, you can press <F4> to view the level-by-level detailed information on a host drive and its components which help in getting an overview of a specific host drive. Press <F5> to switch the hard disk LEDs of the selected host drive on and off. Press <F10> to refresh the window.

You can create new host drives from the Select Host Drive Screen by selecting the *Create new Host Drive* menu option (Figure 10-42) and pressing Enter. Before creating a new host drive, the IIR controller scans all channels for free hard disks (for example, hard disks which are not yet part of a host drive) and displays these free disks in the Select Physical Drive screen (see Figure 10-43). Use the arrow up and down keys to move the selection bar from one hard disk to another, and use the space bar to select/deselect hard disks. Marked hard disks show an ‘*’ in the first column.

After selecting the hard disks, press Enter, and the Choose Type window becomes active (see [Figure 10-43](#)). The Choose Type window displays all host drive types and enables the appropriate types depending on the number of selected hard disks and the firmware level of the IIR controller. Select the appropriate RAID level type and press Enter to confirm your selection.

Figure 10-43. Select Physical Drive and Choose Type Screens



StorCon displays a security message pointing out that all existing data on the selected hard disks will be destroyed (see [Figure 10-44](#)). Press <Y> to continue with creating the new host drive or press <N> to cancel and return to the Select Physical Drive screen.

Figure 10-44. Create Host Drive Confirmation



After you press <Y>, StorCon displays the Used Capacity per Drive popup window (see [Figure 10-45](#)). You may limit the capacity of each selected hard disk for the new host drive. This can be helpful when procuring future spare hard drives (see [Section 2.1, Determine the RAID Configuration](#) for details). Type in the capacity to use per hard disk and press Enter.

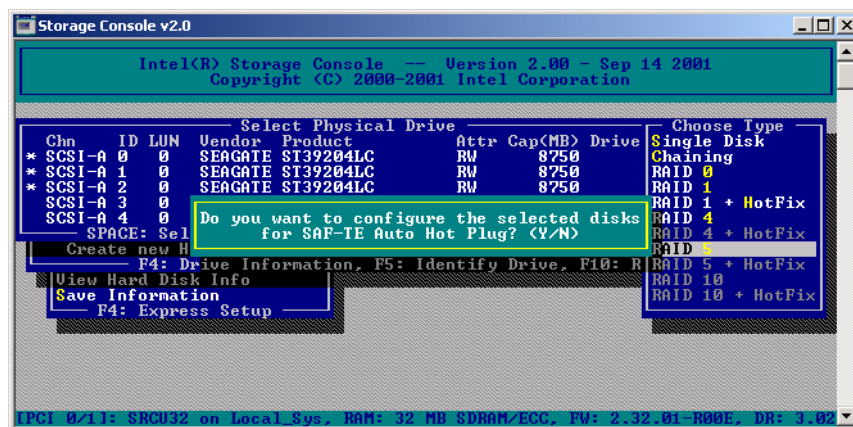
Note: If the entire hard disk capacity is not used when configuring a RAID 1 host drive, you **cannot** use the remaining capacity to expand the array drive in the future.

Figure 10-45. Hard Disk Capacity to Use



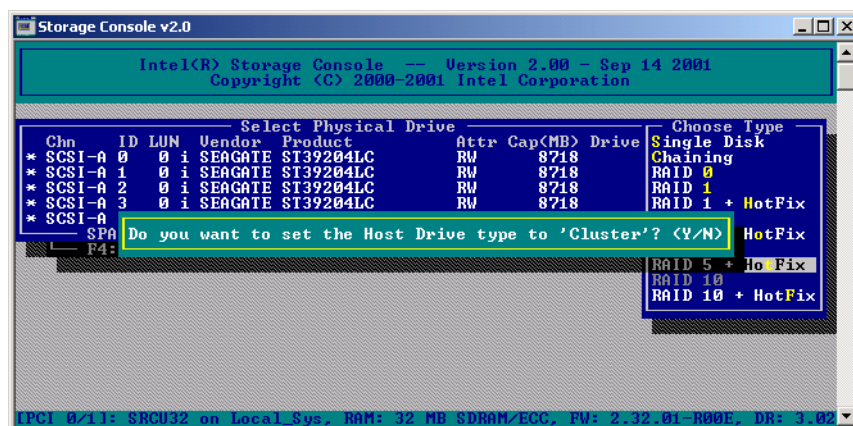
StorCon pauses to determine if you want to configure the selected disks for SAF-TE Auto Hot Plug (use this option only with hot swap disks and equipment). See [Figure 10-46](#). Press <Y> or <N> to confirm your choice.

Figure 10-46. SAF-TE Auto Hot Plug



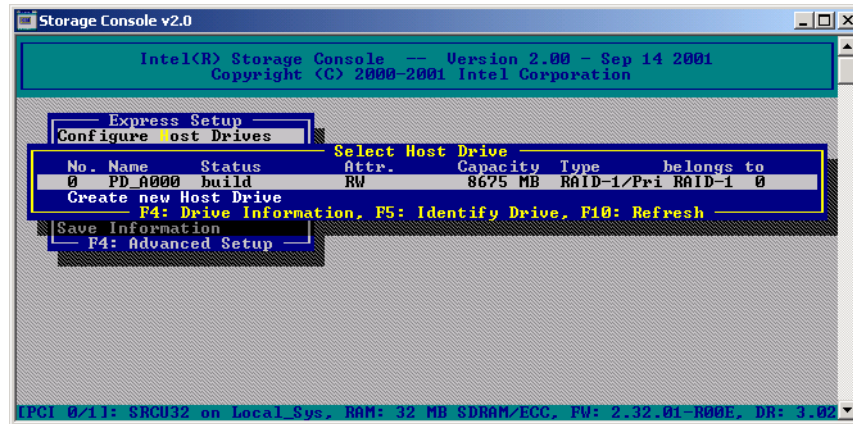
StorCon then asks if you want to set the host drive type to Cluster (see [Figure 10-47](#)). Refer to your product's Hardware Guide to determine if clustering is supported before pressing <Y> or <N> to confirm your choice.

Figure 10-47. Cluster Popup Window



StorCon then creates and configures the new host drive and adds it to the list on the Select Host Drive screen (see [Figure 10-48](#)). All SCSI parameters are adjusted to the optimum values.

Figure 10-48. Newly Created Host Drive



StorCon begins the build process on the new host drive. In the example, it calculates the parity information and writes it to the hard disks. The status during this process is *build* (for more details regarding the status definitions, refer to [Section 10.4.1.2](#)).

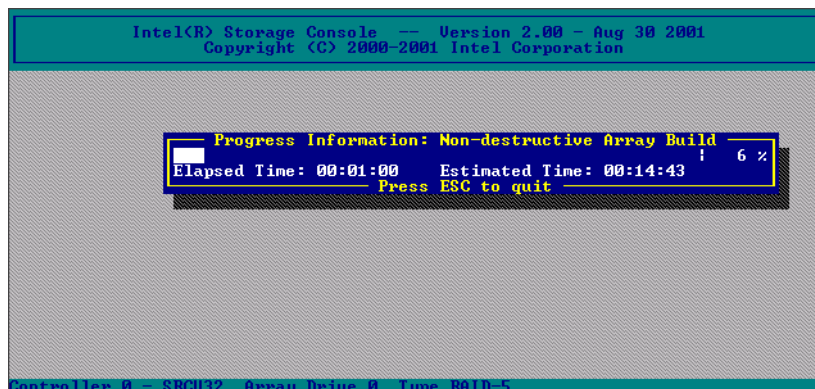
When the build is successfully finished, the status changes to *ready*. You can press <F10> to refresh the screen and see the updated status of the host drive.

The type of initialization build determines how the redundancy information is calculated. There are 2 build types, the Destructive Build and the Non-destructive Build. Only available if StorCon is loaded with <Ctrl>+<G>, the Destructive Build deletes any data by writing a "0" pattern across all hard disks. This initialization process is very fast since no read IOs or parity calculation is involved. However, the initialization build must be successfully finished before leaving StorCon, otherwise the build mode is automatically changed to Non-destructive during the next boot. The Non-destructive Build reads the data blocks, calculates the parity from the contents of the data blocks, and stores it to the corresponding sectors on the disks. This process takes 5-10 times longer than the Destructive Build typically, but the Non-destructive Build can run in the background, for example, during the installation of the operating system.

Note: After escaping from StorCon during the first RAID 5 initialization build, StorCon displays the screen shown in [Figure 10-49](#). Although StorCon indicates the first RAID 5

initialization build as “Non-destructive”, any data present on the drives being initialized is destroyed. However, re-initialization of this RAID array is Non-destructive.

Figure 10-49. Progress Information: Non-destructive Array Build



10.4.1.2 Host Drive Statuses

The Select Host Drive screen displays a status for each configured host drive (for example, the RAID 1 array drive in [Figure 10-48](#) has a status of *build*). Definitions for all states are provided below.

Idle State

The *idle* state is characterized by the fact that the redundant information of the disk array has never been entirely created. The disk array is in this state after its first configuration and until you quit StorCon. Should an error occur while the array is in the *build* state, the array returns to *idle*. The exception is that if during *build* mode the dedicated drive of RAID 4 fails, the mode changes to *fail*.

Build State

After the disk array has been configured for the first time, it assumes the *build* state. While the array is in the *build* state, redundancy information is calculated and stored to the hard disks of the array.

Ready State

The disk array is fully operational when in the *ready* state. All redundant information is present, for example, a hard disk can fail without impairing the functionality of the disk array. This is the normal state of a disk array. The state *ready/expand* indicates that the RAID level and/or capacity are currently migrated/expanded.

Fail State

The disk array changes to the *fail* state whenever a logical drive fails. Redundancy information is still present, thus allowing the remaining hard disks to continue working. This state should be eliminated as soon as possible by replacing the defective hard disk. If

a so-called hot fix (*hot spare*) drive has previously been assigned to a disk array with StorCon, the controller will automatically replace the defective drive and start the reconstruction of the data and the redundant information. Therefore, under these circumstances, the *fail* state is only temporary and will be eliminated by the controller itself.

Note: If a RAID4 or a RAID5 array drive is in the error state and the firmware boots, you will see an error message as shown below.

```
"RAID-5 Host Drive 1: Multiple drives have failed"
"Array is in ERROR state and read only"
"Check disks, cables, termination, termpower, LVDS operation,
power supply, etc."
```

If the array drive can be patched to fail state (all member drives are available; only the one which failed first may be missing) the following messages are displayed:

```
"If the problem is resolved you can choose 'y' to patch the array
to fail state (y/n) "
```

Entering "y" results in a patch to fail. The default behavior is performing the patch.

If the patch was successful, the array status is set to Fail/Patch and the following message is displayed:

```
"Patching the array drive was successful"
```

If the patch failed, the following message is displayed:

```
"Patching the array drive was not possible"
```

If the patch was not performed or if the patch failed, the following messages are displayed:

```
"Use the controller setup program to analyze the problem"
"Press RETURN to continue"
```

Rebuild State

The disk array will assume the *rebuild* state after the automatic activation of a hot fix drive or after a manual replacement carried out with StorCon. The data and the redundant information are reconstructed and stored to the new drive.

Expand State

If the capacity or RAID level of an existing disk array is changed, the disk array changes its state into *expand*. As soon as the expansion or migration is completed, the state changes back to *ready*.

Error State

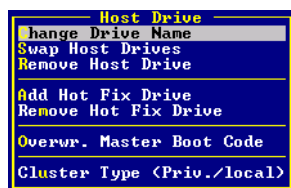
Should a second hard disk fail while the disk array is in the *fail* or *rebuild* state, it is not possible to continue the working session without restrictions. The disk array is still available for I/Os, but data loss and error messages on the host level are possible.

Some of the states listed above may have the addition of */patch* (for example *build/patch*, *ready/patch*). This indicates that the original array drive went through a significant procedure, for example, the parity information was recalculated anew or the array drive has been patched from the error state into the fail state. This may become helpful in a situation where two logical drives of an array drive fail at the same time, but only one of the two logical drives is really defective and the other was blocked out since it was connected with the same I/O channel as the defective one. The array drive's state is error and normally all data would be lost. The IIR software includes some functions that allow the patch of this array drive from the error state into the fail state. Before the actual patch, the defective drive has to be physically removed from the array drive. Such a patch procedure should only be used after a consultation with a trained support person (in which case, a printout of the Save Information file is extremely helpful; see [Section 10.6.4](#) for details).

10.4.1.3 Host Drive Screen

From the Express Setup menu, select *Configure Host Drives* and press Enter to display a list of any existing host drives in the Select Host Drive screen. To configure an existing host drive, highlight the drive in the Select Host Drive screen ([Figure 10-48](#)) and press Enter. The Host Drive screen opens ([Figure 10-50](#)). The various menu options for this screen are described below.

Figure 10-50. Host Drive Menu for an Existing Host Drive



Change Drive Name

Use *Change Drive Name* to change the name of a host drive. The name serves to identify a host drive with StorCon. For example, you could name the boot host drive “Boot” and the data host drive “Data”.

Swap Host Drives

When a computer is switched on, the host drives are initialized in the order of the host drive list, which means that the operating system is booted from the host drive with the lowest number. For reasons of flexibility, a host drive's position in the list can be changed. However, the position of the host drive from which the operating system is booted and the position of the host drive from which StorCon (disk version) was started (both can be the same), cannot be changed. If you wish to change the position of these drives, you have to

boot the operating system and StorCon from a floppy disk or use StorCon from the Flash-RAM of the IIR controller. To change the position of a host drive in the host drive list, highlight the host drive and confirm by pressing Enter. Then, type in the new position and press Enter.

Remove Host Drive

Removing a host drive results in the loss of all data. **All data will be lost after removal.** If you remove a host drive belonging to an array drive for which several host drives exist (after capacity expansion, or after splitting), all other host drives will also be removed.

Add Hot Fix Drive

Add Hot Fix Drive allows you to add a hot fix drive to an existing RAID 1, RAID 4, RAID 5, or RAID 10 array drive. There are two different types of hot fix drives: *Private* and *Pool* hot fix drives. A pool hot fix drive is a spare drive within the so-called hot fix pool. A drive in a hot fix pool is available for several array drives as a hot fix drive. Thus, several array drives can share one hot fix drive. Once this drive has been used by one of the array drives, it is no longer available to the others. A private hot fix drive is dedicated to one RAID 1, RAID 4, RAID 5, or RAID 10 array drive.

Remove Hot Fix Drive

Remove Hot Fix Drive allows you to remove a previously assigned hot fix drive.

Overwrite Master Boot Code

This option creates a valid and consistent master boot record on the selected host drive and should be carried out on any new host drive on which Windows NT is installed. **Never use this function when the host drive contains valid data, as all data will be lost.**

Cluster Type (Priv./local)

The option, *Cluster Type (Priv./local)*, is available only with IIR controllers which are equipped with Cluster Firmware and allows you to assign one host drive to several IIR controllers (Type Cluster). See [Section A.1, Server Clustering](#) for details on clustering.

Note: Refer to your product's Hardware Guide to determine if clustering is supported.

10.4.2 Repair Array Drives

From the Express Setup menu, select *Repair Array Drives* and press Enter to display a list of the array drives in the Summary screen. This function allows the online repair of array drives which show failed drives. StorCon displays a summary of all installed array drives and the number of array drives which are in critical states. For example, there is one array drive in the *Fail* state in [Figure 10-51](#).

Figure 10-51. Array Drive Summary

```

Summary
2 Array Drives installed
1 Array Drives in FAIL state
0 Array Drives in ERROR state
0 Array Drives in BUILD state
0 Array Drives in REBUILD state
0 missing Private HotFix Drives

Press any key.

```

Press any key and StorCon displays a list of array drives which are candidates for online automatic repair.

Note: Array drives that are in the *Error* state are very critical and have lost 2 or more drives. These array drives cannot be repaired with the *Repair Array Drives* function. In such critical cases, data integrity can no longer be maintained.

Select the array drive and StorCon displays the drive that failed. For example, the hard disk that forms logical drive 5 has a failed state in Figure 10-52.

Figure 10-52. Failed Hard Drive

```

Select Drive to repair
No. Name Type State
0 RAID5 RAID-5 fail
F4: Disable Alarm

```

After confirmation, the failed drive must be removed from the system and the new one configured on the same ID and installed in the system. See Figure 10-53 and Figure 10-54.

Figure 10-53. Replace Hard Drive Prompt

```

Physical Disk SEAGATE ST39204LC
at channel SCSI-B, ID 3,
which belongs to Logical Drive 1
failed. Do you want to replace it? (Y/N)

```

Figure 10-54. Replace Hard Drive Prompt

```

The Disk SEAGATE ST39204LC at channel SCSI-B, ID 3 will be replaced.
Please plug in a disk at the same channel with the same ID.
YOU MUST NOT DO ANY UNPLUGGING OR PLUGGING ON OTHER CHANNELS

Press any key after hot plug.

```

StorCon detects the new drive and expects clearance to build this drive as a replacement into the array drive. See Figure 10-55.

Figure 10-55. Add Disk to Array Confirmation

```

You plugged in the disk SEAGATE ST39204LC, ID 3 at channel SCSI-B.
Do you want to add this disk to the Array? (Y/N)

```

When clearance is given, the state of the array drive changes to *Rebuild*, for example, the missing data is reconstructed out of the remaining data and redundancy information. See [Figure 10-56](#).

Figure 10-56. Array Drive Summary



```
Summary
2 Array Drives installed
0 Array Drives in FAIL state
0 Array Drives in ERROR state
0 Array Drives in BUILD state
1 Array Drives in REBUILD state
0 missing Private HotFix Drives
Press any key.
```

The *Error* state of an array drive is critical. There are several procedures in the firmware to handle such cases and bring back the array drive into operation without losing data. See [Figure 10-57](#).

Figure 10-57. Array Drive Error State Dialog



```
Drive in ERROR state cannot be repaired automatically!
Contact your SysAdmin or the customer support of
Intel Corporation.
```

10.5 Advanced Setup

After selecting an IIR controller from the Select Controller screen (see [Figure 10-39](#)), StorCon initially displays the Express Setup and Monitor menus (see [Figure 10-40](#)). Press <F4> to switch to the Advanced Setup and Monitor menus (see [Figure 10-41](#)). You can toggle between the Express Setup and Advanced Setup menus by pressing <F4>.

Advanced Setup has the following menu options.

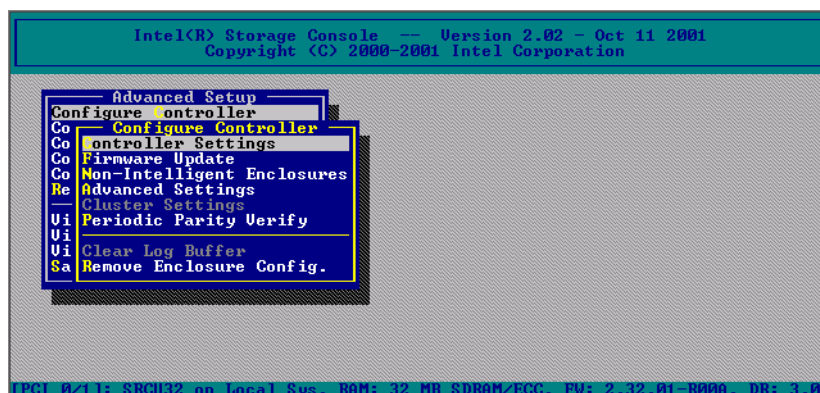
- *Configure Controller* - to setup the IIR controller. Here, you can change the cache settings, termination, memory test, etc.
- *Configure Physical Devices* - to initialize the devices at the physical level, for example, change the SCSI protocol, transfer rates, etc.
- *Configure Logical Drives* - to configure or create logical drives.
- *Configure Array Drives* - to configure or create array drives.
- *Configure Host Drives* - to configure already existing host drives or create new ones.
- *Repair Array Drives* - to repair array drives which have failed drives.

Below the Advanced Setup menu is the Monitor menu (see [Section 10.6, Monitor Menu](#), for more information).

10.5.1 Configure Controller

From the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu (Figure 10-58). This menu has the following options.

Figure 10-58. Configure Controller Menu



10.5.1.1 Controller Settings

From the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Controller Settings* option and press Enter to display the Controller Settings dialog (Figure 10-59).

Use the up arrow and down arrow keys to switch between options, and toggle a setting by pressing <Enter> to choose a parameter.

Use the Controller Settings dialog to view and change IIR controller parameters and settings. A description of each of the settings is provided in Table 10-11.

Figure 10-59. Controller Settings Dialog



Table 10-11. Controller Settings

Parameter	Alternatives	Description
Cache	On	IIR cache (write and read cache) On
	Off	IIR cache (write and read cache) Off
Delayed Write	On	Write cache On
	Off	Write cache Off
BIOS	Enabled	BIOS enabled
	Disabled	BIOS disabled, but <Ctrl>+<G> allowed
	Removed	BIOS and <Ctrl>+<G> disabled
BIOS Warning Level	All Messages	All IIR BIOS warnings and errors are displayed
	Fatal Errors	Only fatal messages are displayed
SETUP from Flash-RAM	Disabled	<Ctrl>+<G> not possible
	Enabled	<Ctrl>+<G> allowed
Display	Off	<Ctrl>+<G> not displayed at system boot level
	On	<Ctrl>+<G> displayed at system boot level
Supported BIOS Drives	2	The IIR BIOS supports 2 drives
	7	The IIR BIOS supports 7 drives
CD-ROM Boot	Disabled	Boot from CD-ROM disabled
	Enabled	Boot from CD-ROM enabled
Memory Test	No test	No test at all
	Standard	Standard test
	Double scan	Double scan test
	Intensive	Intensive test (takes longer)
Halt on Firmware messages	Off	Don't stop display of firmware messages during system boot
	On	Stop display of firmware messages during system boot when any error occurs
Immediate Hard Disk start	Off	Initiate hard disks one at a time
	On	Initiate all hard disks at the same time
Chn. SCSI-A Termination	Auto	SCSI termination according to occupied connectors
Chn. SCSI-A SCSI ID	0,1,2,3,4,5,6,7	Possible SCSI IDs for the channel
Chn. SCSI-B Termination	Auto	SCSI termination according to occupied connectors
Chn. SCSI-B SCSI ID	0,1,2,3,4,5,6,7	Possible SCSI IDs for the channel

All information concerning physical, logical, array and host drives are stored twice (*primary and secondary configuration data*) on each hard disk. For example, the IIR controller itself carries no configuration data of a specific disk array. For this reason the



migration of host drives between IIR controllers is very easy and secure, even if the SCSI IDs and channels are changed. Simply connect the hard disks to the new IIR controller, and the host drives will be automatically available.

10.5.1.2 Firmware Update

From the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Firmware Update* option and press Enter to begin the process for updating the firmware.

Firmware Update allows you to update the firmware, controller BIOS, and XROM StorCon currently programmed on the flash memory of the IIR controller. Because the Flash-RAM can be reprogrammed many times, the software modules can be easily updated, without having to remove the controller from its PCI slot.

The firmware, controller BIOS, and XROM StorCon are part of the file, SRC_RXFW.xxx, where the file extension xxx indicates the version stepping. There is a firmware file on the RAID Software Suite CD-ROM. To get the latest firmware for the IIR controller, visit our web site at: <http://support.intel.com>.

Note: The *Firmware Update* option is not available when StorCon is accessing the IIR controller remotely.

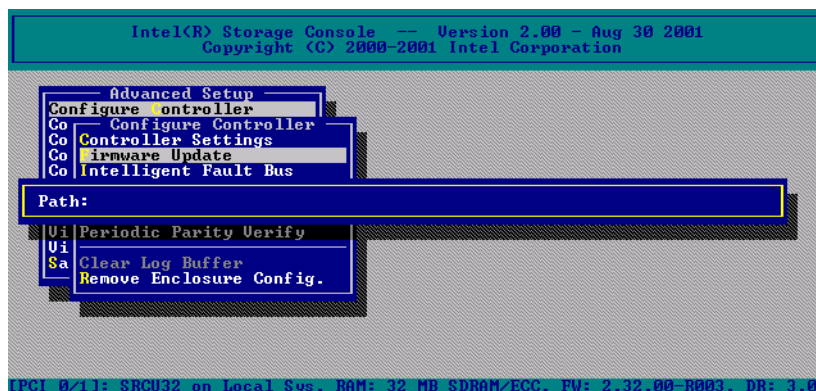
Follow the procedure below to update the firmware via XROM StorCon or the OS version of StorCon.

1. Format a 3.5" HD disk (1.44MB) and copy the SRC_RXFW file onto the disk. Obtain the SRC_RXFW file from the RAID Software Suite CD-ROM, or if necessary, download the firmware image containing the latest programs/drivers from the web site.
2. Launch StorCon, select the applicable IIR controller and press Enter.
3. If the *Express Setup* menu is displayed, press <F4> to display the *Advanced Setup* menu. Select the menu option, *Configure Controller* and press Enter. Insert the floppy containing the latest firmware file into the floppy disk drive.
4. From the Configure Controller submenu, select *Firmware Update* and press Enter.
5. XROM StorCon automatically searches for the firmware file from the floppy drive, a:\.

The OS version of StorCon asks for the path to the file (see [Figure 10-60](#)). Type in the path to the floppy drive and press Enter.

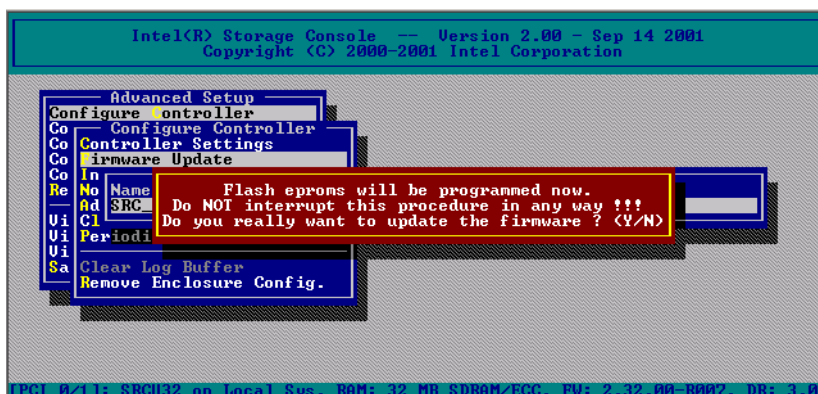
After finding the file, StorCon displays the name, description and version of the firmware. Press Enter.

Figure 10-60. Firmware Update



6. StorCon reads and checks the firmware file, then displays the warning in Figure 10-61. Press <Y> to confirm the firmware update. Press <N> to cancel the firmware update and return to the Configure Controller menu screen.

Figure 10-61. Firmware Update Warning



7. Only after you press <Y> to confirm the firmware update does StorCon program the flash eeprom.

Warning: Do not interrupt the update process to avoid damaging the firmware image in the Flash. If the firmware is interrupted, you will need to follow the Firmware Recovery process described in the accompanying Hardware Guide of your IIR controller.

After StorCon indicates that the update is complete, press any key.

8. The focus returns to the Configure Controller submenu. Press <Esc> several times to close the menus and press <Y> to quit StorCon.
9. StorCon detects the firmware update and requires a system reboot. Press any key to reboot.

During boot up, the system displays the updated firmware version. You can also relaunch StorCon and select the applicable IIR controller to view its new firmware version at the bottom of the console (for example, FW:2.32.00-Rxxx).

10.5.1.3 Intelligent Fault Bus

To access this menu option, from the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Intelligent Fault Bus* option and press Enter.

Intelligent Fault Bus is an older subsystem standard, which is no longer used in modern subsystems or backplanes. IIR Ultra/Wide Disk Array Controllers were the last IIR controllers supporting this standard, sometimes also called “DEC Fault Bus”.

Today’s modern subsystems are using SCSI Accessed Fault-Tolerant Enclosures (SAF-TE) as communication links to the controller. These intelligent subsystems are normally built on so-called backplanes, which host hard disks equipped with Single Connector Attachment (SCA) connectors. The backplane has dedicated electronics with microprocessor and firmware which allows intelligent communication between the subsystem/backplane and the IIR controller. Through this channel the subsystem can report its temperature and the power supply status to the IIR controller. The major objective of SAF-TE is *auto hot plug*. In contrast to *hot plug*, auto hot plug allows a defective drive to be simply removed from the subsystem and the replacement unit installed in its place. Both the IIR controller and the subsystem control this process so that problems on the SCSI bus are eliminated and the rebuilding of the missing data is initiated automatically. No further user interaction is necessary.

10.5.1.4 Non-Intelligent Enclosures

To access this menu option, from the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Non-Intelligent Enclosures* option and press Enter to display the Select Enclosure screen ([Figure 10-62](#)).

Since SAF-TE subsystems are expensive, the IIR controller integrates functionality which allows for the control of up to 16 non-intelligent enclosures with up to 15 hard disks each, and provides for auto hot plug.

In the example in [Figure 10-62](#), one subsystem is defined. The hard disks with their disk shuttles could also be mounted directly into the server enclosure. The term *enclosure* in this case is a definition set, which includes all hard disks which should be auto hot pluggable.

Figure 10-62. Select Enclosure

Select Enclosure			
No.	Vendor	Name	Status
0	MALIBU	PA46-350	Configured
1			Not Configured
2			Not Configured
3			Not Configured
4			Not Configured
5			Not Configured
6			Not Configured
7			Not Configured
8			Not Configured
9			Not Configured
10			Not Configured
11			Not Configured
12			Not Configured
13			Not Configured
14			Not Configured
15			Not Configured
ENTER: Select, F4: Edit Vendor/Name			

The example in Figure 10-63 shows the slots of the enclosure which have been assigned with hard disks. To fill an empty slot, press Enter and select the desired hard disk. See Figure 10-64.

Figure 10-63. Enclosure Slots

Enclosure Slots							
Slot	Chn	ID	LUN	Vendor	Product	Attr.	Cap(MB) Drive
0	SCSI-A	0	1	QUANTUM	ATLAS10K2-TY184J	RW	17509 Drive 4
1	SCSI-B	15	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 5
2	SCSI-C	14	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 6
3	SCSI-D	0	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 7
4	SCSI-E	1	0	1	IBM	DPSS-309170M	RW 8747 Drive 0
5	SCSI-E	3	0	1	IBM	DPSS-309170M	RW 8747 Drive 1
6	SCSI-E	6	0	1	IBM	DDYS-T18350M	RW 17501 Drive 2
7	SCSI-F	6	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 3
8	No hard disk installed in this slot						
9	No hard disk installed in this slot						
10	No hard disk installed in this slot						
11	No hard disk installed in this slot						
12	No hard disk installed in this slot						
13	No hard disk installed in this slot						
14	No hard disk installed in this slot						
15	No hard disk installed in this slot						
ENTER: Add/Remove Disk							

Figure 10-64. Select Disk

Enclosure Slots							
Slot	Chn	ID	LUN	Vendor	Product	Attr.	Cap(MB) Drive
0	SCSI-A	0	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 4
1	SCSI-B	15	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 5
2	SCSI-C	14	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 6
3	SCSI-D	0	0	1	QUANTUM	ATLAS10K2-TY184J	RW 17509 Drive 7
4	SCSI-E	1	0	1	IBM	DPSS-309170M	RW 8747 Drive 0
5	SCSI-E	3	0	1	IBM	DPSS-309170M	RW 8747 Drive 1
6	SCSI-E	6	0	1	IBM	DDYS-T18350M	RW 17501 Drive 2
7 No hard disk installed in this slot							
Select Disk							
Chn	ID	LUN	Vendor	Product	Attr	Cap(MB)	Drive
SCSI-F	6	0	1	QUANTUM	ATLAS10K2-TY184J	RW	17509 Drive 3
ENTER: Select Disk							
12 No hard disk installed in this slot							
13 No hard disk installed in this slot							
14 No hard disk installed in this slot							
15 No hard disk installed in this slot							
ENTER: Add/Remove Disk							

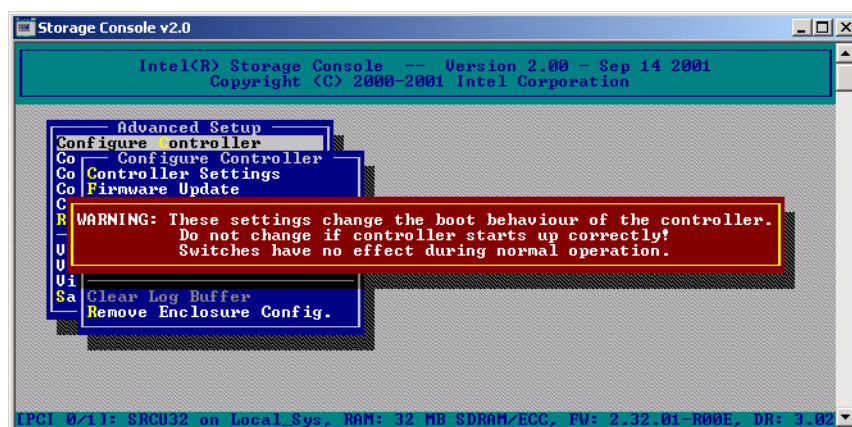
SAF-TE is recommended for auto hot pluggable subsystems. Only with these systems can a secure auto hot plug be guaranteed. For non-intelligent subsystems, we recommend only the best quality components (disk shuttles, cables, terminators, etc.).

10.5.1.5 Advanced Settings

To access this menu option, from the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Advanced Settings* option and press Enter.

Within *Advanced Settings*, there are three settings which control the configuration and address behavior of the IIR controller's BIOS and DPMEM. StorCon displays a warning message (see [Figure 10-65](#)) before allowing you to change these settings.

Figure 10-65. Advanced Settings Warning



Press any key to continue, and the Advanced Settings screen appears (see [Figure 10-66](#)). A description of each of the settings is provided in [Table 10-12](#). Use the up arrow and down arrow keys to switch between screen options, and toggle a setting by pressing <Enter> to choose a parameter.

Figure 10-66. Advanced Settings Dialog



Table 10-12. Advanced Settings

Parameter	Options	Description
Shrink BIOS after POST	Off	The BIOS is not shrunk after the POST phase.
	On	The BIOS is always shrunk after the POST phase.
	Auto	The IIR controller decides whether or not to shrink the BIOS.
BIOS RAM allocation method	Auto	The BIOS address space is automatically allocated.
	Older	The BIOS address space is allocated according to an older PCI specification.
DPMEM mapping	Move below 1MB	The DPMEM address space is allocated below 1MB.
	Do not move	The DPMEM address space is always above 1MB.

10.5.1.6 Cluster Settings

To access this menu option, from the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Cluster Settings* option and press Enter to display the Cluster Channels screen (Figure 10-67).

Note: Refer to the accompanying Hardware Guide of the IIR controller to determine if the *Cluster Settings* option is supported.

The *Cluster Settings* menu option is selectable only with IIR controllers that are equipped with cluster firmware. This menu allows the user to enable and disable the IO channels of the IIR controller for clustering. Special care must be taken that the IO processors of a shared channel have different IDs, otherwise, there will be conflicts. A description of each of the cluster settings is provided in Table 10-13. Use the up arrow and down arrow keys to switch between screen options, and toggle a setting by pressing <Enter> to choose a parameter.

Figure 10-67. Cluster Channels Screen



Table 10-13. Cluster Channels Settings

Parameter	Options	Description
Clustering Chn. SCSI-A	Disabled	Clustering on Channel A is disabled.
	Enabled	Clustering on Channel A is enabled.
Clustering Chn. SCSI-B	Disabled	Clustering on Channel B is disabled.
	Enabled	Clustering on Channel B is enabled.

10.5.1.7 Periodic Parity Verify

To access this menu option, from the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Periodic Parity Verify* option and press Enter to display the Periodic Parity Verify screen (Figure 10-68).

Periodic Parity Verify does a consistency check on the RAID, calculating new parity information and comparing it with the parity on the RAID array. This menu option allows the user to set the date and time when the parity is verified, for example, once a day at 9 a.m. The user may also set the scheduled verification to stop if it encounters a problem or to continue and automatically repair the parity on the RAID.

A description of each of the *Periodic Parity Verify* settings is provided in Table 10-14. Use the up arrow and down arrow keys to switch between screen options, and toggle a setting by pressing <Enter> to choose a parameter.

Figure 10-68. Periodic Parity Verify Screen

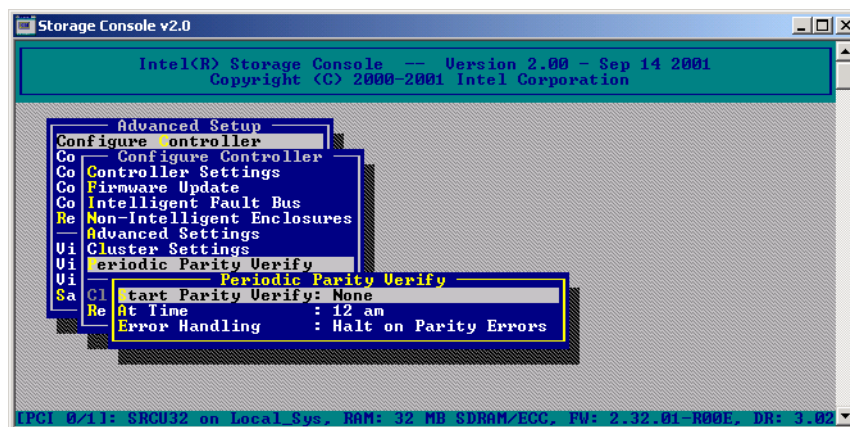


Table 10-14. Periodic Parity Verify Settings

Parameter	Options	Description
Start Parity Verify	None	No parity verify is scheduled.
	Every day	Parity verify is scheduled every day.
	Every 2 days	Parity verify is scheduled every 2 days.
	Every 3 days	Parity verify is scheduled every 3 days.
	Every 4 days	Parity verify is scheduled every 4 days.
	Every 5 days	Parity verify is scheduled every 5 days.
	Every 6 days	Parity verify is scheduled every 6 days.
	Every 7 days	Parity verify is scheduled every 7 days.
At Time	12am to 11pm, in hourly intervals	Periodic verify is scheduled on the hour selected.
Error Handling	Halt on Parity Errors	Halt when parity errors found.
	Repair Parity Errors	Automatically repair parity errors when found.

10.5.1.8 Clear Log Buffer

The IIR controller records certain events in a logging buffer which is part of the Flash-RAM. The *Clear Log Buffer* function detects and deletes entries from the log buffer.

It is recommended to clear all events in the buffer when using the IIR controller in a new system.

Note: The *Clear Log Buffer* option is enabled in the XROM version of StorCon and disabled in the OS version of StorCon.

To access this menu option, from the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Clear Log Buffer* option and press Enter.

StorCon displays a warning message to verify whether or not to clear the log buffer. Press <Y> to clear the buffer or press <N> to cancel the operation.

10.5.1.9 Remove Enclosure Config.

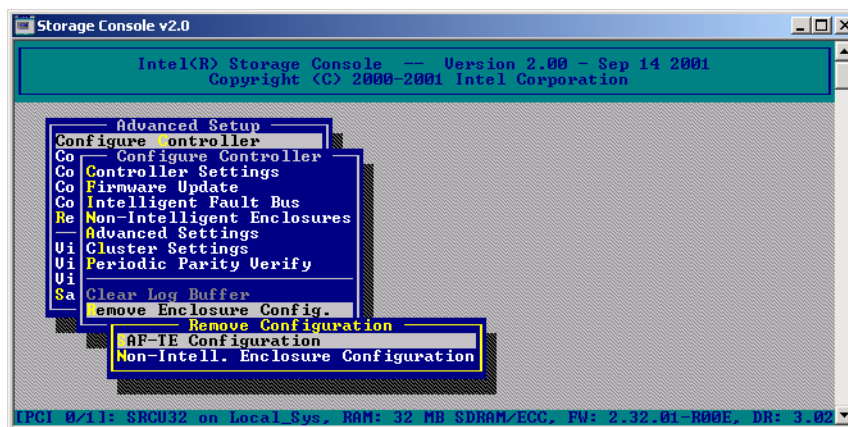
To access this menu option, from the Advanced Setup menu, select the *Configure Controller* option and press Enter to display the Configure Controller menu, then select the *Remove Enclosure Config.* option and press Enter to display the Remove Configuration screen ([Figure 10-69](#)).

This menu option allows for the removal of the SAF-TE configuration or the 'Non-Intelligent Enclosures' Configuration from the disks. This is necessary if the slot configuration is corrupted or the disks are removed from a SAF-TE enclosure. In the latter case there is no longer a SAF-TE processor available where you may change or remove the SAF-TE information from the disks.

To remove SAF-TE enclosure configurations, in the Remove Configuration screen, select the option, *SAF-TE Configuration*. StorCon displays a warning message to enable you to verify your choice. Press <Y> to remove the configuration, or press <N> to cancel the operation.

To remove non-intelligent enclosure configurations, in the Remove Configuration screen, select the option, *Non-Intel. Enclosure Configuration*. StorCon displays a warning message to enable you to verify your choice. Press <Y> to remove the configuration, or press <N> to cancel the operation.

Figure 10-69. Remove Configuration Screen



10.5.2 Configure Physical Devices

Configure Physical Devices allows for the setup and configuration of physical drives (hierarchy level 1).

From the Advanced Setup menu, select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive menu (Figure 10-70). This menu option displays a list of IO channels and available devices.

Figure 10-70. Select Physical Drive

Select Physical Drive						
Chn	ID	LUN	Vendor	Product	Attr	Cap(MB) Drive
SCSI-A 7	0		SCSI I/O Processor			
SCSI-B 6	0		ESG-SHU	SCA HSBP M7		
SCSI-B 0	0	i	SEAGATE	ST39204LC	RW	8718 Drive 2
SCSI-B 1	0	i	SEAGATE	ST39204LC	RW	8718 Drive 1
SCSI-B 2	0	i	SEAGATE	ST39204LC	RW	8718 Drive 0
SCSI-B 3	0	i	SEAGATE	ST39204LC	RW	8718
SCSI-B 4	0	i	SEAGATE	ST39204LC	RW	8718
SCSI-B 7	0		SCSI I/O Processor			
Rescan for new device						
Plug in new disk <Hot Plug>						
F4: Extended Information, F5: Identify Drive, F8: Repair						

Below is a description of each column in the Select Physical Drive screen:

- Chn - The IO channel (“SCSI” stands for SCSI).
- ID - Device ID.
- LUN - Logical Unit Number (LUN), which is normally always 0.
- (No header) - This column is either filled with a lowercase *i* (for initialized), or is empty. “Initialized” means the creation of IIR-specific configuration data on the hard disks and the adjustment of hard disk specific operating parameters (protocol, transfer rate, etc.).
- Vendor - Device vendor.
- Product - Product type of device.
- Attr - The attribute of the given device. For a hard drive, the attribute may be set to *RW* for Read/Write or *RO* for Read Only. IO processors and SAF-TE processors do not have attributes assigned.
- Cap (MB) - The capacity of the given hard disk in MB (1MB = 1024KB; 1GB=1024MB).
- Drive - Drive number assignment of the given physical device to a logical/array/host drive.

Within the Select Physical Drive screen, you can scroll the list of devices with the cursor up/down keys.

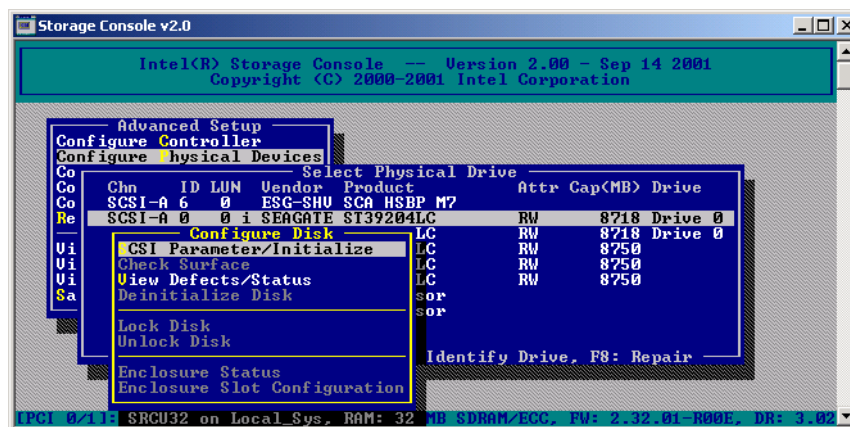
Press <F4> to display any extended information about the selected device.

Press <F5> to switch any available LED’s of the corresponding drive on and off. This function helps to identify a specific physical drive in an array of many drives.

Press <F8> to repair the configuration data of a physical drive. If an IIR controller should ever display a message like “Detected Primary Configuration Data error, using Secondary” during the boot sequence, repair the data with <F8>.

Within the Select Physical Drive screen, you can highlight a disk drive to select it and press <Enter> to open the Configure Disk screen (Figure 10-71). All relevant adjustments and modifications concerning the selected item can be carried out using this menu.

Figure 10-71. Configure Disk



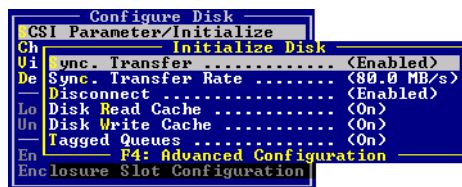
10.5.2.1 SCSI Parameter / Initialize

To access this function, from the Advanced Setup menu:

- Select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive screen.
- Select a device and press Enter to display the Configure Disk screen.
- Select *SCSI Parameter/Initialize* option and press Enter to display the Initialize Disk window (Figure 10-72).

Note: Advanced Setup allows parameter configurations of newly created host drives. In Express Setup, however, StorCon automatically adjusts these same parameters to their respective best values. If you create new host drives via the Express Setup menu, StorCon and the IIR controller will automatically adjust all parameters to their respective best values. The transfer rate per drive depends on circumstances like cables, terminators, etc. For example, if a certain configuration does not allow 160 MB/sec., the drive is automatically “throttled” down to the next trouble-free transfer rate (see Figure 10-72).

Figure 10-72. Initialize Disk



When a SCSI hard disk drive is initialized the first time by the RAID controller, its SCSI parameters may or may not be automatically set to their optimal settings. The following section describes manual configuration of these settings. **For certain RAID controllers and/or situations, certain parameters described in this section may not be configurable. Refer to the accompanying Hardware Guide for details.**

Caution: Disk initialization can destroy all data on the hard disk.

StorCon copies IIR controller specific configuration blocks on the hard disk, a primary block and a mirrored secondary block. You should always check that they are all “Enabled” or “On”. If the hard disk you have selected is an Ultra160 device and the IIR controller has Ultra160 SCSI channels, <F4> *Advanced Configuration* allows you to configure the so-called *Domain Validation* (a cyclical check of the correct data transfer at a given rate). Normally this parameter is Off.

The SCSI bus can operate two methods of data transfer: asynchronous and synchronous. Each SCSI device must be able to perform the first type of transfer, the second type is optional. The advantage of the synchronous transfer is a higher data transfer rate, since the signal transfer times on the possibly long SCSI cable have no influence on the transfer rate. This mode is only effective if both devices support synchronous transfer and can communicate with each other in this mode.

Sync. Transfer

This parameter disables or enables synchronous data transfer.

Sync. Transfer Rate

This is the synchronous data transfer rate in MB/s. Ultra160 SCSI allows up to 160 MB/s.

If a SCSI cable does not permit a certain transfer rate, the transfer rate can be reduced to a value that permits trouble-free data transfer. Lowering the transfer rate may also become necessary when using a configuration which does not allow full speed. See [Figure 10-72](#).

Disconnect

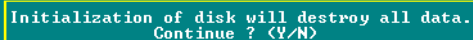
You can connect several components to a SCSI bus. It is particularly important to guarantee a high degree of overlapping action on the SCSI bus. This high degree of overlapping becomes possible when a SCSI device has *Disconnect* enabled.

Disk Read Cache / Disk Write Cache / Tagged Queues

For performance reasons, the read ahead and write cache of the hard disk should be always On. *Tagged Queues* is a SCSI feature which allows the drive to execute more than one command at a time. If available, it should also be On.

If you leave this configuration form by pressing <Esc> and you have made changes, StorCon displays a security request. The warning of the destruction of all data ([Figure 10-73](#)) may require different evaluations, depending on the device's current state and the options you selected.

Figure 10-73. Disk Initialization Confirmation



```
Initialization of disk will destroy all data.
Continue ? (Y/N)
```

Note: If this operation is the first initialization of the device, for example, the drive was previously connected to a different controller, all data will be lost. If the device has already been initialized, and only internal parameters such as Disconnect, Synchronous

Transfer, and Disk Read/Write caches, or Tagged Queues have been changed, the data on the drive remains intact. Only the functional state of the device changes.

10.5.2.2 Format Disk

Note: The Format Disk option is available in the XROM version of StorCon but is not available in the OS version of StorCon.

To access this function, from the Advanced Setup menu:

- Select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive screen.
- Select an uninitialized disk and press Enter to display the Configure Disk screen.
- Select the *Format Disk* option and press Enter.

Warning: This option destroys all data on the hard disk.

Format Disk prepares the selected hard disk for reading and writing. Since hard disk manufacturers deliver their products pre-formatted and surface tested, it is neither usually necessary, nor advisable, to format new hard disks. Additionally, the time required to format a disk depends on the hard disk itself, and for some disks, formatting may take a considerable amount of time.

Note: Before formatting, StorCon asks the user whether to delete the “Grown Defect” table of the hard disk. Some users incorrectly believe that a table deletion makes a newly formatted hard disk with grown defects reusable. However, a re-assign occurs when the system accesses the disk's bad sectors, resulting in a new grown defect. Press <Y> to delete the grown defects list or press <N> to keep the list.

StorCon then displays a warning that formatting may last several hours and will destroy all data. Press <Y> to format the disk or press <N> to cancel the disk formatting.

Caution: Never interrupt a Format Disk procedure. This may lead to a non-functioning hard disk.

10.5.2.3 Check Surface

To access this function, from the Advanced Setup menu:

- Select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive screen.
- Select an uninitialized disk and press Enter to display the Configure Disk screen.
- Select the *Check Surface* option and press Enter.

Warning: This option destroys all data on the hard disk.

This option checks the surfaces of the selected hard disk media. The IIR controller writes and reads certain data patterns and checks them for correctness.

After you choose the *Check Surface* option, StorCon displays a warning that performing this command will destroy all data. Press <Y> to do a surface check or press <N> to cancel. If you choose to do the surface check, StorCon displays a progress information bar with the elapsed time and estimated time of completion. You can interrupt the surface check by pressing <Esc>.

10.5.2.4 View Defects/Status

To access this function, from the Advanced Setup menu:

- Select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive screen.
- Select a disk and press Enter to display the Configure Disk screen.
- Select the *View Defects/Status* option and press Enter.

View Defects/Status displays information about the grown defects, primary defects and last status of the selected physical drive. See [Figure 10-74](#) and table below.

Figure 10-74. View Defects/Status

```
Grown defects: 0
Primary defects: 183
Last status: 0x00000000
```

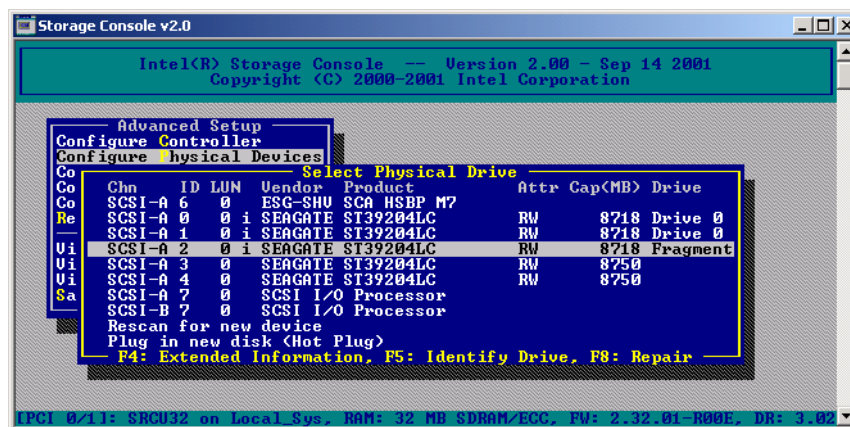
Parameter	Description
Grown Defects	Number of media defects that have occurred in addition to the media defects the hard disk had upon delivery.
Primary Defects	Number of media defects that the hard disk had upon delivery.
Last Status	The Last Status gives detailed information on the last failure of a hard disk. The information is only present until the next hard reset of the system and may help for deeper failure analysis or tracing.

10.5.2.5 Deinitialize Disk

To access this function, from the Advanced Setup menu:

- Select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive screen.
- To enable the *Deinitialize Disk* option, select a disk that is initialized and fragmented and press Enter to display the Configure Disk screen. (See example in [Figure 10-75](#). StorCon shows the selected disk with statuses of *i* {initialized} and *Fragment* {fragmented}).
- Select the *Deinitialize Disk* option and press Enter.

Figure 10-75. Select Physical Drive Screen with Initialized and Fragmented Disk

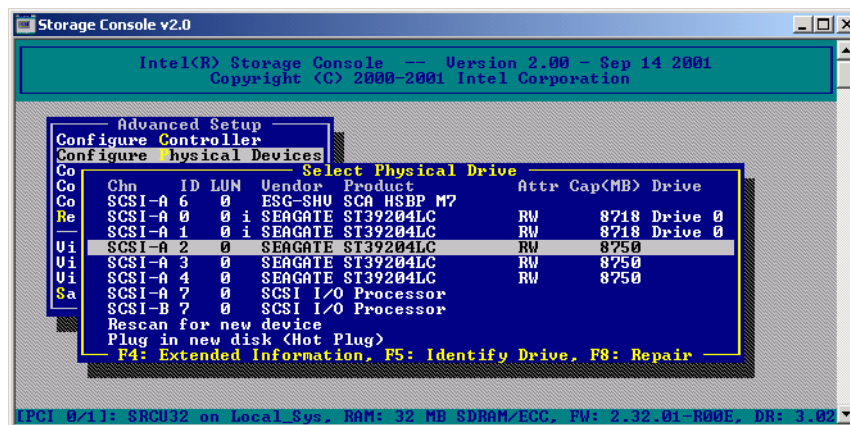


Warning: This option destroys all data on the hard disk.

This menu option allows you to de-initialize a hard disk which has previously been initialized for use with the IIR controller. By doing so, the specific IIR controller information present on the device is removed. Obviously, the de-initialization cannot restore data that was lost during initialization.

After you select the *Deinitialize Disk* option, StorCon displays a message to confirm de-initializing the selected disk. Press <Y> to de-initialize the selected disk or press <N> to cancel the function. If you press <Y>, StorCon completes the function and displays the selected disk as no longer initialized (no *i*) or fragmented (no *Fragment*) on the Selected Physical Drive screen (see Figure 10-76).

Figure 10-76. Select Physical Drive Screen with De-initialized Disk



10.5.2.6 Lock Disk or Unlock Disk

To access these functions, from the Advanced Setup menu:

- Select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive screen.
- Select a disk and press Enter to display the Configure Disk screen.
- Select either the *Lock Disk* or *Unlock Disk* option and press Enter.

This option is only available when you have selected a removable hard disk (for example, Iomega* or SyQuest*). Before you can initialize a cartridge, you must lock it. Before removing it, you must unlock it.

10.5.2.7 Enclosure Status or Enclosure Slot Configuration

To access these functions, from the Advanced Setup menu:

- Select the *Configure Physical Devices* option and press Enter to display the Select Physical Drive screen.
- Select an enclosure and press Enter to display the Configure Disk screen.
- Select the *Enclosure Status* or *Enclosure Slot Configuration* option and press Enter.

Before you can use the auto hot plug with a SAF-TE subsystem, you must configure the subsystem (more precisely, its intelligence, the so-called SEP SAF-TE Enclosure Processor).

After you select the *Enclosure Status* option, StorCon displays the Enclosure Status screen (see [Figure 10-77](#)).

Figure 10-77. Enclosure Status

Enclosure Status	
Audible Alarm Status	(Not available)
Door Lock Status	(Not available)
Power supply 0 status	(Operational and on)
Power supply 1 status	(Operational and on)
Fan 0 status	(Operational)
Fan 1 status	(Operational)
Fan 2 status	(Operational)
Enclosure temperature	(OK)
Temperature sensor 0	(33 °C / 91 °F OK)
F10: Refresh Info	

Note: Un-initialized disks cannot be configured as no RAID configuration information can be stored on these disks.

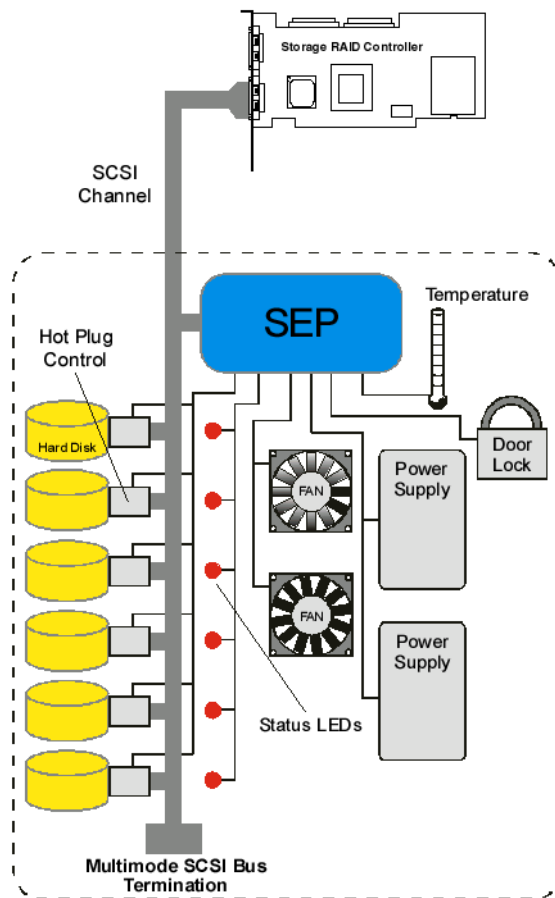
After you select the *Enclosure Slot Configuration* option, StorCon displays the Enclosure Slots screen (see [Figure 10-78](#)). To assign a specific hard disk to a SAF-TE enclosure slot, press Enter on the empty slot and choose one of the hard disks.

Figure 10-78. Enclosure Slots

Slot	Chn	ID	LUN	Vendor	Product	Attr.	Cap(MB)	Drive
0	SCSI-A 9	0	1	SEAGATE	ST39102LC	RW	8682	
1	SCSI-A 10	0	1	FUJITSU	MAF3364LC	RW	34746	
2	SCSI-A 11	0	1	FUJITSU	MAF3364LC	RW	34746	Drive 4
3	SCSI-A 12	0	1	FUJITSU	MAF3364LC	RW	34746	
4	SCSI-B 1	0	1	SEAGATE	ST39175LC	RW	8682	
5	SCSI-B 2	0	1	SEAGATE	ST39175LC	RW	8682	Drive 6
6	SCSI-B 3	0	1	SEAGATE	ST39175LC	RW	8682	
7	SCSI-B 4	0	1	SEAGATE	ST39175LC	RW	8682	
ENTER: Add/Remove Disk								

[Figure 10-79](#) shows a block diagram of a SAF-TE subsystem.

Figure 10-79. Block Diagram of a SAF-TE Subsystem

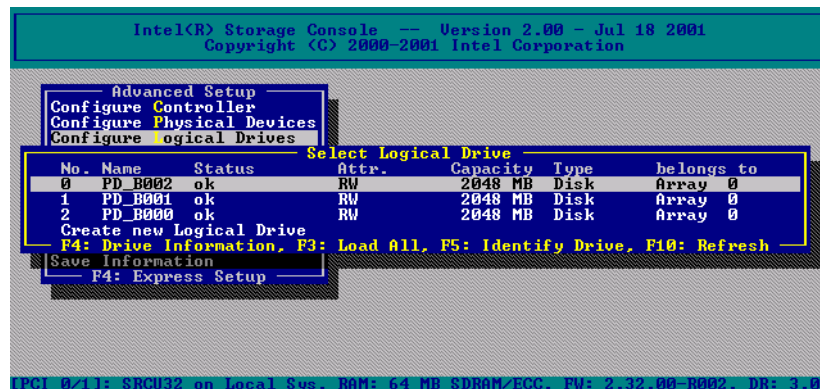


10.5.3 Configure Logical Drives

Configure Logical Drives allows for the setup and maintenance of logical drives (hierarchy level 2).

From the Advanced Setup menu, select the *Configure Logical Drives* option and press Enter to display the Select Logical Drive menu (Figure 10-80).

Figure 10-80. Select Logical Drive



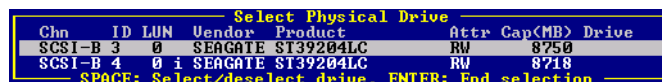
In the Select Logical Drive screen, you can press <F4> to list all hard disks of a logical drive. If it is a logical drive of the type *Disk*, it only consists of one single hard disk. If a logical drive consists of more hard disks, it is of the type *Chain* (concatenation of several hard disks). Press <F3> to load all hard disks and press <F5> to identify the corresponding drives by turning their LEDs on and off. Press <F10> to refresh the Select Logical Drive screen.

10.5.3.1 Create New Logical Drive

Create new Logical Drive allows you to configure and setup a new logical drive.

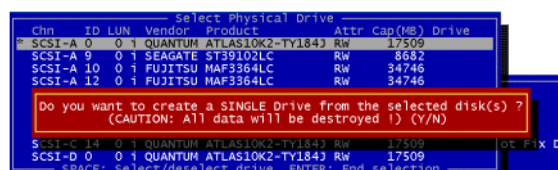
To access this function, from the Advanced Setup menu, select the *Configure Logical Drives* option and press Enter to display the Select Logical Drive screen, then select the *Create new Logical Drive* option and press Enter. StorCon displays a list of free physical drives (which are not already part of a logical drive) in the Select Physical Drive screen (see Figure 10-81).

Figure 10-81. Select Physical Drive



If you select one physical drive with the space bar and press Enter, StorCon suggests creating a *SINGLE* drive out of this hard disk. See the example in Figure 10-82.

Figure 10-82. Create Single Drive



Next, enter the appropriate drive size and press Enter (see [Figure 10-83](#)). StorCon allows you to limit the hard disk size for this host drive. This becomes important when you configure disk arrays and you want to ensure that future drives added to the disk array fit in the array (for replacement purposes). Should a new drive have less than the required capacity, StorCon cannot accept it.

Figure 10-83. Drive Size



If you select two or more physical drives with the space bar and press Enter, StorCon suggests the creation of a logical drive of the type *Chain*. In some literature, disk chaining is also called *Disk Spanning*.

Picture the functioning mechanism of a type Chain logical drive as follows: all hard disks forming the logical drive are linked together one by one in the exact same order in which they were selected with the space bar. This concatenation can be compared to a chain. If, for example, the logical drive consists of 4 hard disks with 2000MB each, the logical drive will have a capacity of 8000MB. When data is written to this logical drive, the first hard disk is filled first, then the second, and so on.

Although it is not advisable, logical drives of the type Chain can also be components of array drives.

10.5.4 Configure Array Drives

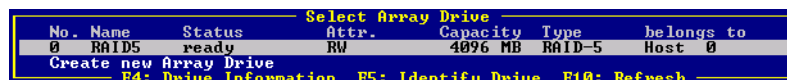
The *Configure Array Drive* menu option allows you to configure array drives (hierarchy level 3). Array drives with the following listed RAID levels can be configured within this menu.

RAID 0	Pure Data Striping without Redundancy
RAID 1	Disk Mirroring
RAID 4	Data Striping with Dedicated Parity Drive
RAID 5	Data Striping with Striped Parity
RAID 10	RAID 0 Combined with RAID 1

The IIR controller can manage up to 35 array drives (with different RAID levels) simultaneously. Obviously, the number of hard disks will limit the number of parallel arrays that can be used.

From the Advanced Setup menu, select the *Configure Array Drives* option and press Enter to display the Select Array Drive menu ([Figure 10-84](#)).

Figure 10-84. Select Array Drive



No.	Name	Status	Attr.	Capacity	Type	belongs to
0	RAID5	ready	RM	4096 MB	RAID-5	Host 0

Create new Array Drive
F4: Drive Information, F5: Identify Drive, F10: Refresh

In the Select Array Drive window, you can press <F4> to display detailed information on the selected array drive level-by-level (for example, the structure, the order, or which hard disks are part of the array drive). Press <F5> to turn on the LEDs of all hard disks belonging to this array drive in order to identify them. Press <F10> to refresh the window.

10.5.4.1 Array Drive Menu for Existing Array Drives

If you press Enter on a specific drive in the Select Array Drive window, StorCon displays the Array Drive menu (see [Figure 10-85](#)). Below is a description for each of the Array Drive menu options.

Figure 10-85. Array Drive Menu



Change Drive Name

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Change Drive Name* option, press Enter and type in the new array drive name.

The *Change Drive Name* command allows you to change the name of an array drive. The name serves to identify an array drive. This can be helpful for configurations where several host drives of various types are operated by a single controller.

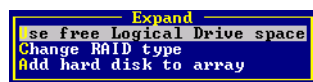
Expand Array Drive

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Expand Array Drive* option and press Enter.

After you select the *Expand Array Drive* option, StorCon displays the Expand popup window (see [Figure 10-86](#)).

Figure 10-86. Expand Popup Window



The Expand popup window contains three major functions:

Function	Description
Use free Logical Drive space	Conversion of free space on the logical drives into a separate host drive.
Change RAID Type	Migration of the RAID level of an array drive. RAID 0 to RAID 4 and vice versa RAID 0 to RAID 5 and vice versa
Add hard disk to array	Expansion of the capacity of an array drive.

Note: If the entire hard disk capacity is not used when configuring a RAID 1 host drive, you **cannot** use the remaining capacity to expand the array drive in the future.

Note: If StorCon is closed, migration of the RAID level may not complete.

To migrate or expand an array drive, the state must be *ready*. The data on the array drive remains intact and is not affected by the expansion.

Warning: When starting an expand process, the unused capacity of the current array components (i.e. "Use free Logical Drive space") is activated and the drive enters a *build* state. At this point the array is put in the non-redundant build process, so it is very important to create a full backup before you start this process. If during the build process a disk fails, then the array changes to *idle = not functioning*, and the expansion process continues until the array drive enters the *fail* state.

Add RAID 1 Component

The *Add RAID 1 Component* option allows you to add, to a logical drive which is member of an array drive, another logical drive as a mirror drive (RAID 1).

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Add RAID 1 Component* option and press Enter.

Example: You have configured an array drive with 4 logical drives. One logical drive has failed and the array drive has gone into the fail state. Another failure would cause data loss. Unfortunately, you find another logical drive which is likely to fail (for example, you hear a strange noise coming from it, or its grown defect counter explodes). If you initiate a hot plug, it is very likely that this critical logical drive will also fail, resulting in data loss. To avoid this problem, mirror a new, good logical drive to the critical one. When the

copying is finished, you can remove the critical logical drive and then carry out a hot plug procedure. You can also use this function to mirror RAID 4/5 array drives (RAID 5+1, RAID 4+1).

Replace Array Component

Note: The Replace Array Component option is not available for RAID 1 and RAID 10 volumes if you are manually hot swapping drives. Instead, use the Repair Array Drives option on the main menu in the Storage Console, or use the Add RAID1 Component option under the Configure Logical Drives menu.

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Replace Array Component* option and press Enter.

If a logical drive of an array drive without a hot fix drive should fail (or is likely to fail), you should replace the defective hard disk with a new one as soon as possible because the array drive is without redundancy. The replacement logical drive has to have at least the same capacity as the failed one. After installing the replacement hard disk as a new logical drive, add it to the array drive. After selecting the logical drive that needs to be replaced, StorCon offers a list of existing logical drives which can be used as replacement units. The array drive's state changes into *rebuild* and the missing data is automatically reconstructed on the new logical drive.

Remove RAID 1 Component

This option corresponds to the *Add RAID-1 Component* option. It allows you to remove a previously configured RAID-1 combination.

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Remove RAID 1 Component* option and press Enter.

After you choose the *Remove RAID 1 Component* option, StorCon displays a warning message to confirm the removal (see [Figure 10-87](#)). Press <Y> to proceed with the removal of the selected RAID 1 Component, or press <N> to cancel the operation.

Figure 10-87. Remove Drive Confirmation



Do you really want to remove
the selected drive ? <Y/N>

Remove Array Drive

Use the *Remove Array Drive* command to remove an existing array drive.

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Remove Array Drive* option and press Enter.

Warning: This option destroys all data on the array drive.

After you choose the *Remove Array Drive* option, StorCon displays a warning message to confirm the removal of the selected array drive. Press <Y> to proceed with the removal, or press <N> to cancel the operation.

Note: If an array drive has been removed, there is a possibility that it could be rebuilt without data loss if all of the following are true:

- It is reconstructed in the exact same order it had been built before.
- The components of the array drive, that is the host drives, have not been modified.
- The stripe size and RAID level remain the same.
- A Non-destructive build is carried out.

In all other cases, ALL DATA WILL BE LOST.

Add Hot Fix Drive

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Add Hot Fix Drive* option and press Enter.

This submenu option allows you to add a hot fix drive to an existing RAID 1, RAID 4, RAID 5, or RAID 10 array drive.

There are two different types of hot fix drives: *Private* and *Pool* hot fix drives. A pool hot fix drive is a spare drive within the so-called hot fix pool. A drive in a hot fix pool is available for several array drives as a hot fix drive. Thus, several array drives can share one hot fix drive. Of course, once this drive has been used by one of the array drives, it is no longer available for the others. A private hot fix drive is dedicated to one RAID 1, RAID 4, RAID 5 or RAID 10 array drive.

Only drives that meet the following requirements are suitable as hot fix drives:

- It must not be an active component of another array drive.
- It must have a storage capacity greater than or equal to the storage capacity of the smallest logical drive of the array drive.

Example: A RAID 5 array drive consists of the following components:

Logical Drive 0	2000MB
Logical Drive 1	1500MB
Logical Drive 2	1100MB
Logical Drive 3	2000MB

This array drive has a usable storage capacity of 3300MB. A hot fix drive for this array must have at least 1100MB of storage capacity.

Note: To avoid wasting valuable storage capacity, it is recommended that all logical drives forming an array drive have the same storage capacity.

When adding a hot fix drive, select a suitable drive, confirm your selection, and choose whether to make the new hot fix drive be of type Private or Pool.

In the Event of a Drive Failure

The controller will substitute a failed logical drive with a hot fix drive only if the array drive was in the *ready* state before the failure. In other words, a hot fix drive can only be activated if the corresponding array drive had a state of data redundancy at the moment of failure.

The controller activates the *fail* operation mode. In this mode, the array drive remains fully operational. The data located on the failed drive is generated by means of the redundancy information stored on the other drives, without causing any decrease in performance.

The controller integrates the hot fix drive into the array drive and begins reconstructing the data and redundancy information. The array drive is now in the *rebuild* mode.

No other hard disk may fail until all data has entirely been reconstructed on the hot fix drive (because the system is operating without redundancy) without the array drive going into error mode.

Note: In some literature, hot fix drives are also referred to as *hot spare* drives. You can also add or remove hot spare drives using StorCon+.

Remove Hot Fix Drive

This option allows you to remove a hot fix drive from an existing array drive.

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Remove Hot Fix Drive* option and press Enter.

After you choose the *Remove Hot Fix Drive* option, StorCon displays a warning message to confirm the removal of the selected hot fix drive. Press <Y> to proceed with the removal, or press <N> to cancel the operation.

Hot Fix Pool Access

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.

- Select the *Hot Fix Pool Access* option and press Enter.

Use the *Hot Fix Pool Access* option to enable or disable the access of the selected array drive to the hot fix pool.

Parity Verify

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Parity Verify* option and press Enter.

The redundancy information calculated during an array *build* or *rebuild* is stored on a dedicated logical drive (RAID 4), or is distributed over all logical drives of the array drive (RAID 5). This information is often called *parity data*. The calculation is made with an exclusive OR function (XOR). If a logical drive of an array drive fails, its data can be recalculated by means of the data present on the other logical drives of the array drive and the parity data. The *Parity Verify* function allows you to check the consistency of an array drive's parity data. The verification may take quite a long time, but you can terminate it by pressing <Esc>.

Note: If you press the escape key <Esc>, the progress indicator (Figure 10-88) will close. However, parity verify continues to run unless you press the <A> key to abort the parity verify.

Note: Parity verify has the capability to repair bad parity sectors automatically.

Figure 10-88. Progress Information



Periodic Parity Verify

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.
- Select an array drive and press Enter to display the Array Drive window.
- Select the *Periodic Parity Verify* option and press Enter.

Allows you to schedule parity verify activity as described in previous section. Configurable variables include: *Start Parity Verify* (frequency of days to run, default is none), *At Time* (what time to run on the days specified), and *Error Handling* (what action to take when an error is encountered during the parity verify).

Build/Rebuild Progress

To access this function, from the Advanced Setup menu:

- Select the *Configure Array Drives* option and press Enter to display the Select Array Drive screen.

- Select an array drive and press Enter to display the Array Drive window.
- Select the *Build/Rebuild Progress* option and press Enter.

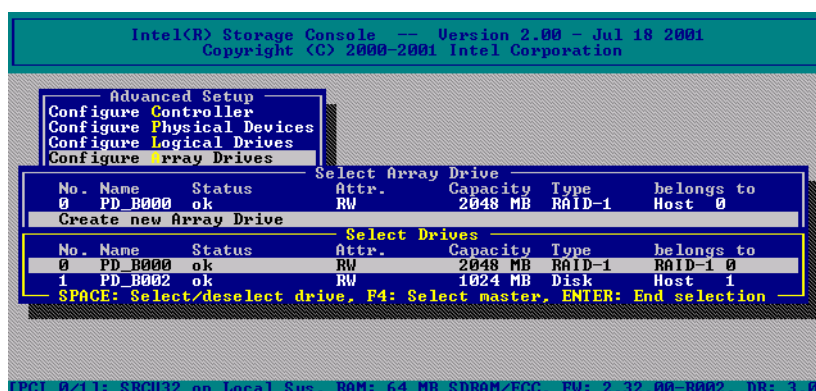
Whenever an array drive is in the *build* or *rebuild* state, you can select *Build/Rebuild Progress* to get progress information and estimates for the required time to build or rebuild.

10.5.4.2 Create New Array Drive

From the Advanced Setup menu, select the *Configure Array Drives* option and press Enter to display the Select Array Drive menu, then select the *Create new Array Drive* option and press Enter.

StorCon lists all logical drives which are free and not yet part of an array or host drive (see [Figure 10-89](#)). The selection bar is moved with the arrow up/down keys and a logical drive is selected/deselected with the space bar.

Figure 10-89. Create New Array Drive



For a striping array (RAID 0, 4, 5, 10), the master drive (indicated by 'M') is the first logical drive in the array (see [Figure 10-89](#)). For a RAID 1 array (mirroring) the master drive is the first logical drive in the array that contains the valid data copied to the second logical drive.

After you press Enter, StorCon displays a list of possible RAID levels. See [Figure 10-90](#). Then StorCon prompts you for the stripe size. This is the size of the stripes into which the data is divided. Valid values are 16KB, 32KB, 64KB or 128KB. The default is 128KB. See [Figure 10-91](#).

Figure 10-90. Choose Type

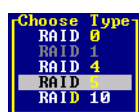


Figure 10-91. Strip Size



The *Build Type* decides how the redundancy information is created. The *Destructive Build* (only available if StorCon was loaded with <Ctrl>+<G>) fills all hard disks with “0” and no further parity calculation is necessary. This build method is pretty fast, but the build must be successfully finished before you can leave StorCon (otherwise the build mode is automatically changed to *Non-destructive* during the next boot). The *Non-destructive* build calculates the redundancy information from the contents of the data stripes. It takes longer, but can run in the background, for example, during the installation of the operating system. See Figure 10-92.

Figure 10-92. Choose Build Type



A warning displays that all data will be destroyed after confirmation. (Figure 10-93). Confirm your choice by pressing <Y>. The array drive is created.

Figure 10-93. Create Array Drive Confirmation



If necessary, you can limit the array drive's capacity. See Figure 10-94.

Figure 10-94. Drive Size Dialog



The array drive enters the build state, for example, the parity information is generated. After completion of the build process the array drive's state is ready, or fault tolerant. See Figure 10-95.

Figure 10-95. Array Drive Status

Select Array Drive						
No.	Name	Status	Attr.	Capacity	Type	belongs to
0	RAID5	build	RW	2048 MB	RAID-5	
Create new Array Drive						
F4: Drive Information, F5: Identify Drive, F10: Refresh						

10.5.4.3 Notes on the Configuration of RAID 0, 1, 4, 5 and 10 Arrays Drives

Use logical drives of the type *disk* to build an array drive.

RAID array drives can be configured with logical drives of the type *chain* also, but security should be taken into consideration. For regular RAID array drives, type *disk* logical drives are used.

Logical drives of an array drive should have the same storage capacity.

To avoid wasting valuable storage capacity, use only logical drives that have the same storage capacity as the logical drive being replaced on that array.

A hot fix drive provides the most security.

One of the reasons RAID array drives are used, lies with the data redundancy they provide, that is, the data security you have in the event of a hard disk failure. For the purpose of the following considerations, we define the term *time without redundancy* (TWR) as the time it takes to replace a failed hard drive (assuming there is no hot fix drive installed in the system). The time without redundancy should be kept as short as possible, not including the time needed to set up the array drive (state *build*).

Assume that one of the hard disks of a RAID 5 array drive has failed. The array drive is without redundancy. TWR begins. Any superfluous prolongation of the TWR (because you have to get a replacement hard disk, or because no one checked the file server) increases the risk of data loss should a second hard disk fail. Therefore, new redundancy should be created as soon as possible and in an entirely automated manner. Integrate a hot fix drive as an immediately available and auto-replacing hard disk to keep the TWR as short as possible. Only a hot fix drive can ensure optimal array drive security and constant data availability. Of course a hot fix drive is not mandatory. If you control the array drive at regular intervals and immediately replace a defective hard disk (by shutting down the system or using a hot fix), you can minimize the risk of data loss.

10.5.5 Configure Host Drives

The *Configure Host Drives* option (Figure 10-105) allows you to configure host drives (level of hierarchy 4). These are the drives the host computer is aware of. Host drives can consist of a single hard disk, or of many hard disks built to create a RAID 5 array drive.

This menu option is similar to the *Configure Host Drives* option in Express Setup (see Section 10.4.1). Unlike Express Setup, Advanced Setup allows the user to select a stripe size while Express Setup defaults the stripe size to 128KB. Also, Advanced Setup has the *Split Host Drive*, *Merge Host Drives*, and *Partition Drive* menu options.

The additional capacity resulting from an online capacity expansion is shown as another host drive. If you expand the capacity of the array drive a second time, there would be three host drives belonging to the same array drive. Since there is currently no operating system which supports “growing hard disks”, this expansion method is the only safe way to introduce new capacity.

Note: The XROM version of StorCon may report an error incorrectly after configuring more than 30 host drives. This false error is indicated by one of the following messages:

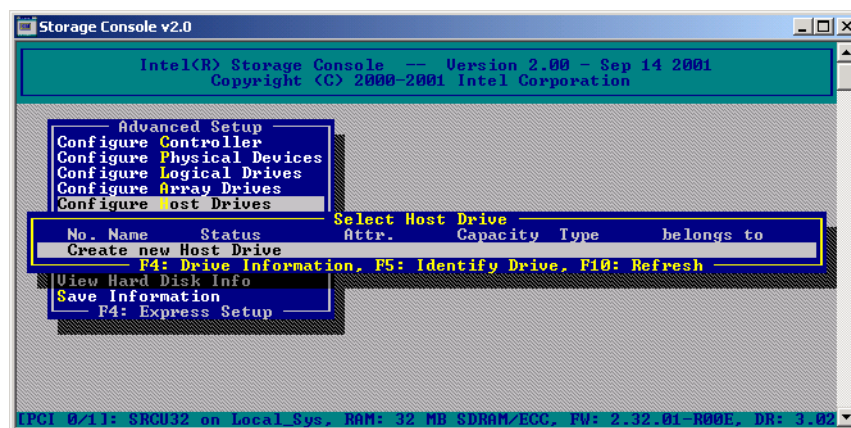
- ‘No more handles’
- ‘Memory allocation failed’

After the system boots into the operating system, however, StorCon shows that all of the host drives exist. This limitation does not occur when configuring more than 30 host drives with the *OS version* of StorCon.

10.5.5.1 Create New Host Drive

From the Advanced Setup menu, select *Configure Host Drives* and press Enter to display a list of existing host drives, if any, in the Select Host Drive screen (Figure 10-96). For an unconfigured system, no host drive entries are displayed.

Figure 10-96. Select Host Drive Screen

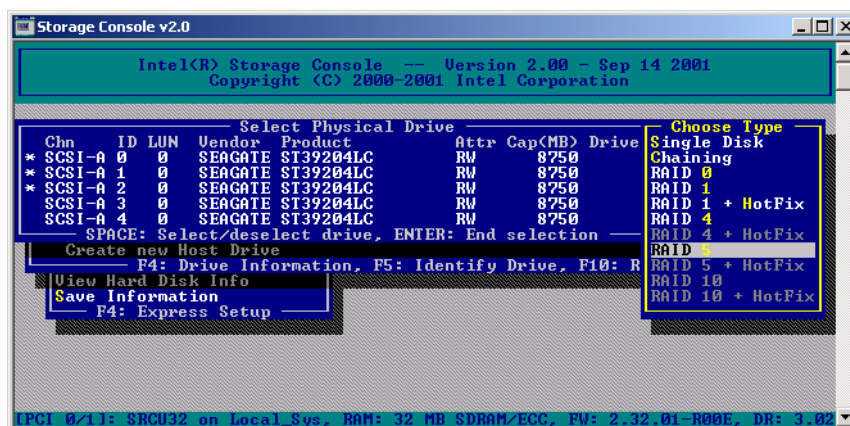


In the Select Host Drive screen, you can press <F4> to view the level-by-level detailed information on a host drive and its components which may assist in getting an overview of a specific host drive. Press <F5> to switch the hard disk LEDs of the selected host drive on and off. Press <F10> to refresh the window.

You can create new host drives from the Select Host Drive screen by selecting the *Create new Host Drive* menu option (Figure 10-96) and pressing Enter. Before creating a new host drive, the IIR controller scans all channels for free hard disks (for example, hard disks which are not yet part of a host drive) and displays these free disks in the Select Physical Drive screen (see Figure 10-97). Use the arrow up and down keys to move the selection bar from one hard disk to another, and use the space bar to select/deselect hard disks. Marked hard disks show an ‘*’ in the first column.

After selecting the hard disks, press Enter, and the Choose Type window becomes active (see Figure 10-97). The Choose Type window displays all host drive types and enables the appropriate types depending on the number of selected hard disks and the firmware level of the IIR controller. Select the appropriate RAID level type and press Enter to confirm your selection.

Figure 10-97. Select Physical Drive and Choose Type Screens



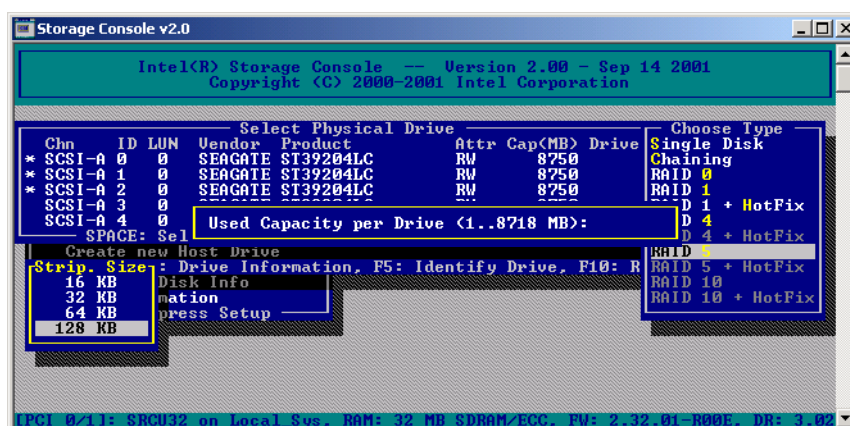
StorCon displays a security message pointing out that all existing data on the selected hard disks will be destroyed (see Figure 10-98). Press <Y> to continue with creating the new host drive or press <N> to cancel and return to the Select Physical Drive screen.

Figure 10-98. Create Host Drive Confirmation



After you press <Y>, StorCon displays the Strip. Size popup window (see Figure 10-99). StorCon defaults to 128 KB stripe size, but you may also select 16KB, 32KB, or 64 KB.

Figure 10-99. Strip Size



After you select the stripe size, StorCon displays the Used Capacity per Drive popup window (see Figure 10-100). You may limit the capacity of each selected hard disk for the new host drive. This can be helpful when procuring future spare hard drives (see Section 2.1, *Determine the RAID Configuration* for details). Type in the capacity to use per hard disk and press Enter.

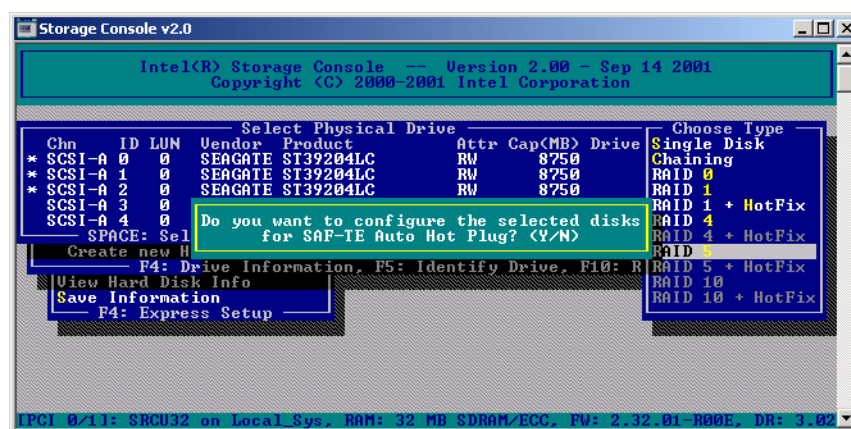
Note: If the entire hard disk capacity is not used when configuring a RAID 1 host drive, you **cannot** use the remaining capacity to expand the array drive in the future.

Figure 10-100. Hard Disk Capacity to Use

Used Capacity per Drive (1..8718 MB):

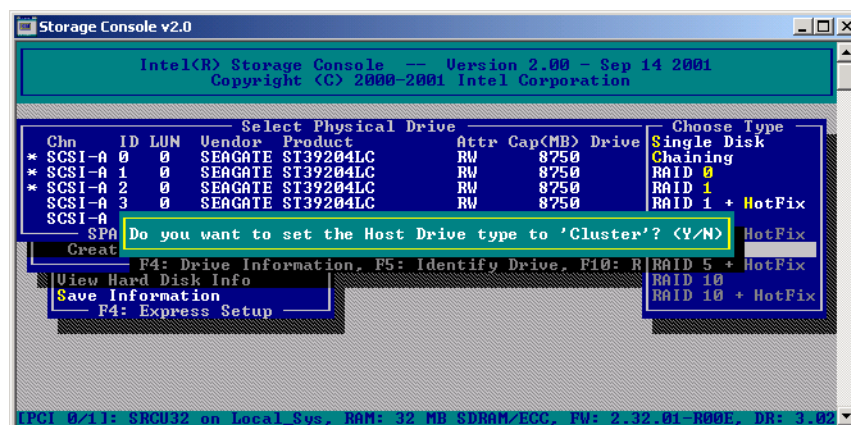
StorCon pauses to determine if you want to configure the selected disks for SAF-TE Auto Hot Plug (use this option only with hot swap disks and equipment). See [Figure 10-101](#). Press <Y> or <N> to confirm your choice.

Figure 10-101. SAF-TE Auto Hot Plug



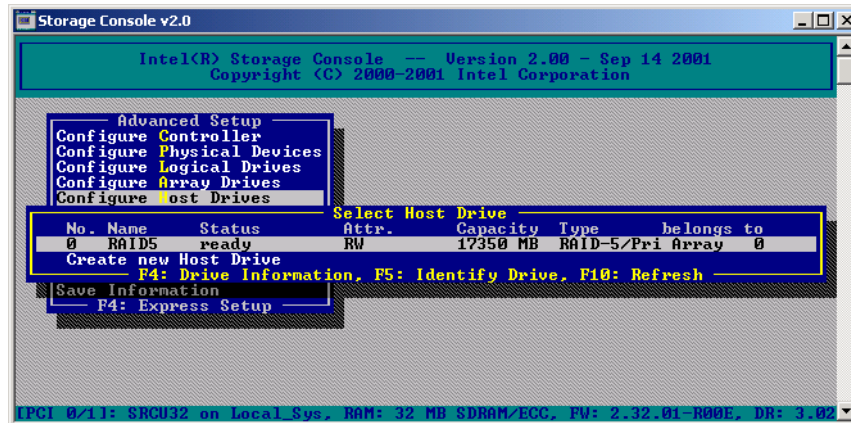
StorCon then asks if you want to set the host drive type to Cluster (see [Figure 10-102](#)). Refer to your product's Hardware Guide to determine if clustering is supported before pressing <Y> or <N> to confirm your choice.

Figure 10-102. Cluster Popup Window



StorCon then creates and configures the new host drive and adds it to the list on the Select Host Drive screen (see [Figure 10-103](#)). All SCSI parameters are adjusted to the optimum values.

Figure 10-103. Newly Created Host Drive



StorCon begins the build process on the new host drive. In the example, it calculates the parity information and writes it to the hard disks. The status during this process is *build* (for more details regarding the status definitions, refer to [Section 10.4.1.2](#)).

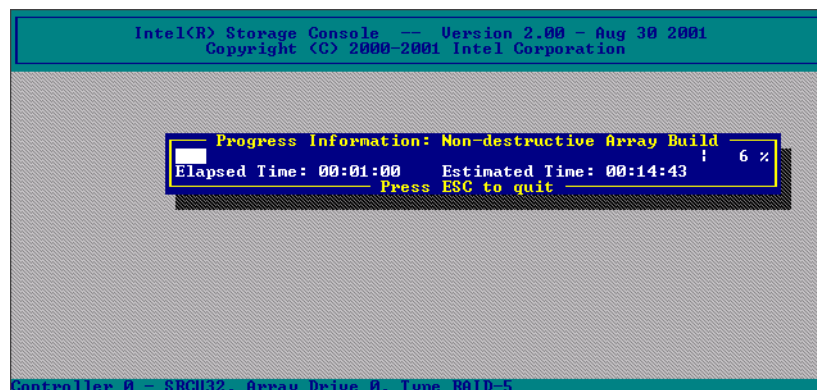
When the build is successfully finished, the status changes to *ready*. You can press <F10> to refresh the screen and see the updated status of the host drive.

The type of initialization build determines how the redundancy information is calculated. There are 2 build types, the Destructive Build and the Non-destructive Build. Only available if StorCon is loaded with <Ctrl>+<G>, the Destructive Build deletes any data by writing a "0" pattern across all hard disks. This initialization process is very fast since no read IOs or parity calculation is involved. However, the initialization build must be successfully finished before leaving StorCon, otherwise the build mode is automatically changed to Non-destructive during the next boot. The Non-destructive Build reads the data blocks, calculates the parity from the contents of the data blocks, and stores it to the corresponding sectors on the disks. This process takes 5-10 times longer than the Destructive Build typically, but the Non-destructive Build can run in the background, for example, during the installation of the operating system.

Note: After escaping from StorCon during the first RAID 5 initialization build, StorCon displays the screen shown in [Figure 10-104](#). Although StorCon indicates the first RAID 5

initialization build as “Non-destructive”, any data present on the drives being initialized is destroyed. However, re-initialization of this RAID array is Non-destructive.

Figure 10-104. Progress Information: Non-destructive Array Build



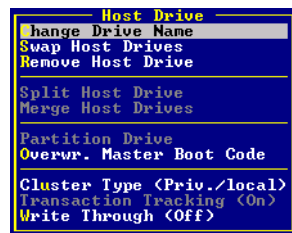
10.5.5.2 Host Drive Statuses

The Select Host Drive screen displays a status for each configured host drive (see [Figure 10-103](#)). Refer to [Section 10.4.1.2](#) for descriptions of the host drive statuses.

10.5.5.3 Host Drive Screen

From the Advanced Setup menu, select *Configure Host Drives* and press Enter to display a list of any existing host drives in the Select Host Drive screen. To configure an existing host drive, highlight the drive in the Select Host Drive screen ([Figure 10-103](#)) and press Enter. The Host Drive screen opens ([Figure 10-105](#)). The various menu options for this screen are described below.

Figure 10-105. Host Drive Menu for an Existing Host Drive



Change Drive Name

Use this command to change the name of a host drive. The host drive name serves to identify a host drive.

Swap Host Drives

When the computer is switched on, the host drives are initialized in the order of the host drive list, which means that the operating system is booted from the host drive having the lowest number. For reasons of flexibility, a host drive's position in the list can be changed. However, the position of the host drive from which the operating system is booted and the position of the host drive from which StorCon (disk version) was started (both can be the same), cannot be changed. To change the position of these drives, you have to boot the operating system and StorCon from a floppy disk or use the StorCon loadable from the Flash-RAM of the controller. To change the position of a host drive in the host drive list, highlight the host drive and confirm with Enter. Then, type in the new position and press Enter.

Remove Host Drive

Warning: All data is lost after the removal of a host drive.

If you remove a host drive belonging to an array drive to which several host drives belong (after capacity expansion, or after splitting), the data on ALL other host drives will be lost.

Split Host Drive

Warning: This command results in all data being lost.

For some purposes, it might be necessary to split an existing host drive into two or several host drives using the *Split Host Drive* option. To the operating system, each new host drive looks like a single hard disk.

Since newly split host drives have smaller capacities, StorCon must write new header information on the new host drives.

Note: *Split Host Drive* is only available in XROM StorCon.

Merge Host Drives

Warning: This command results in all data being lost.

This function reverses the *Split Host Drive* option. Only host drives which belong to the same array drive or logical drive can be merged. Since the new host drives have a larger capacity, StorCon has to write new header information on the newly merged host drive.

Partition Drive

The partitioning menu has similar functions to the MS-DOS program FDISK. You can create and delete a partition and also change the active partition. Just like FDISK, StorCon can handle primary partitions, extended partitions, and logical drives within the extended partitions.

Note: *Partition Drive* is only available in XROM StorCon.

Overwrite Master Boot Code

Warning: Never use this menu option on host drives containing valid data, otherwise all data will be lost.

This option creates a valid and consistent master boot record on the selected host drive and should be carried out on any new host drive on which Windows NT is installed.

Cluster Type (Priv./local)

Note: Refer to the accompanying Hardware Guide to determine if your IIR controller supports clustering.

Use this command to enable the selected host drive for clustering. Shared IO channel(s) of the IIR controllers must be enabled for clustering prior to using this command.

Figure 10-106. Host Drive Cluster



Transaction Tracking

In a cluster configuration, Transaction Tracking logs all changes written to the disks in a specific area on the hard disk (transaction container). This allows recovery from situations where a hardware problem has occurred.

Write Through

When the *Write Through* function is enabled, the controller uses no write caching on the host drive.

10.5.6 Repair Array Drives

The *Repair Array Drives* option on the Advanced Setup menu functions similarly to the comparable option in the Express Setup menu, [Section 10.4.2, Repair Array Drives](#).

10.6 Monitor Menu

The Monitor menu has the following menu options.

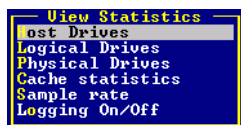
- *View Statistics* - to supervise the performance of the different components of the RAID subsystem.
- *View Events* - to review enhanced event recordings of RAID and controller-specific events.
- *View Hard Disk Info* - to view detailed information on the connected devices (important are the retries, reassigns, grown defects and last status information)

- *Save Information* - to create a complete protocol file of the current RAID subsystem including all settings of the IIR controller and the drives. This file can be used for remote diagnosis.

10.6.1 View Statistics

The *View Statistics* menu (Figure 10-107) display the performance of the drives and their corresponding level of hierarchy. The throughput of the drives is displayed in KB/s (Kilobytes per second) and IO/s (I/O's per second, number of I/O's on the controller). The performance figures reflect the load on the controller and not necessarily the maximum performance the controller can deliver.

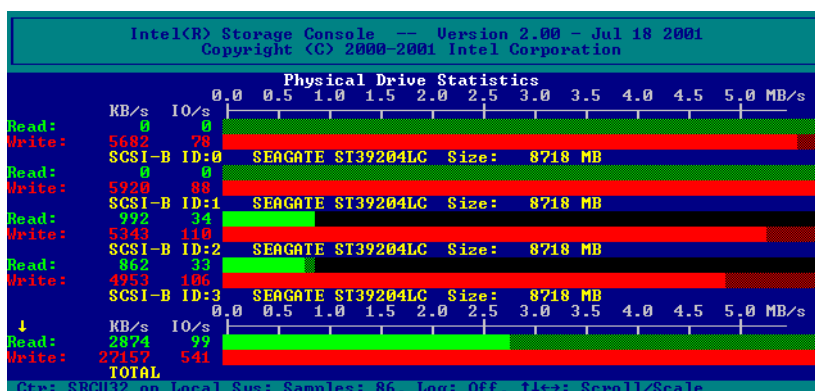
Figure 10-107. View Statistics Menu



When viewing the *Host Drives*, *Logical Drives* and *Physical Drives* statistics for a particular RAID level, StorCon displays a list of all drives within the selected drive level hierarchy. See Figure 10-108 for an example of the *Physical Drives* statistics. In addition to the performance report on the drives, the menu monitor displays the hard disk I/O channel, hard disk ID, hard disk name and hard disk gross capacity (where 1MB = 1024KB). The figures shown at *TOTAL* represent the performance of the host drives as a whole.

Press the left arrow and right arrow keys to change the scale of the graphical KB/s indication. Press the up arrow and down arrow keys to scroll the screen to see additional drives (if available).

Figure 10-108. Physical Drive Statistics



Use *Cache Statistics* to view the utilization of the IIR controller's caches, (read cache and write cache). This option also displays the size of the cache in KB and the settings of both caches (on or off). The figures for "cache hits" show how often requests can be serviced out of the cache, for example, without triggering an immediate disk IO.

Use *Sample Rate* to choose the interval at which the IIR controller delivers new measurements. Depending on the operating system used, the sampling rate can be set to a maximum of 60 seconds. The default setting is 2 seconds.

Use *Logging On/Off* to create a log file which records all the statistical values over a longer period. If you choose On, StorCon asks for the path/name of the log file. See [Figure 10-109](#).

Figure 10-109. Logfile Name



10.6.2 View Events

Use *View Events* to display IIR controller events. Events can also be recorded and saved into a log file. This menu option gives the administrator the ability to analyze and supervise array drives. See [Figure 10-110](#).

Figure 10-110. Controller Events

Controller Events				
Ctr	Cnt	Ext	Text	
0	1	42	Array Drive 0: parity build started	
0	1	20	Array Drive 0: parity build finished successfully	
0	1	42	Array Drive 0: parity build started	
0	1	63	Array Drive 0: parity verify done	
0	1	62	Array Drive 0: parity verify started	
0	1	20	Array Drive 0: parity build finished successfully	
0	1	42	Array Drive 0: parity build started	
0	1	20	Array Drive 0: parity build finished successfully	
0	1	42	Array Drive 0: parity build started	
0	1	24	Array Drive 3: drive build finished successfully	
0	1	44	Array Drive 3: drive build started	
0	1	20	Array Drive 0: parity build finished successfully	
0	1	42	Array Drive 0: parity build started	

F4: scroll, F8: clear, F2: save + clear

10.6.3 View Hard Disk Info

View Hard Disk Info menu shows information for hard disk drives (see [Figure 10-111](#)).

Figure 10-111. Hard Disk Information

Hard Disk Information							
Chn	ID	Vendor	Product	Sync.	Retr.	Reass.	GrDef. Last Status
SCSI-B 0	1	SEAGATE	ST39204LC	80MB	0/0	0	0x00000000
SCSI-B 1	2	SEAGATE	ST39204LC	80MB	0/0	0	0x00000000
SCSI-B 2	3	SEAGATE	ST39204LC	80MB	0/0	0	0x00000000
SCSI-B 3	4	SEAGATE	ST39204LC	80MB	0/0	2	0x00000000
SCSI-B 4	5	SEAGATE	ST39204LC	80MB	0/0	0	0x00000000

F10: Refresh

The hard disk information includes SCSI Channel, SCSI ID, Vendor, Product Type, Retries/Reassigns, Grown Defects and Last Status.

The *Retries* counter records the number of retries to a hard drive (the counter is incremented by one unit whenever the IIR controller retries to access a hard disk. If the counter continues to increase it is likely that the cable is not adequate for the selected data transfer rate (cable is too long, of poor quality or connectors are of poor quality) or that

the SCSI bus is not properly terminated (too many terminators on the cable or a missing terminator). In very few cases is the hard disk defective. The retries counter also increments when the SCSI parameters of a hard disk are changed.

The *Reassigns* counter records the number of media defects which occur on a hard drive. Defective blocks of a hard drive are assigned substitute blocks (spare blocks) that are either on the same track, or on alternate ones if all spare blocks on the same track are already in use. The administration of the reassignments is carried out by the hard drive through reassignment tables. If you observe that the number of reassigns is constantly increasing, you may assume that something is wrong with the drive.

Note: If a hard disk works with alternate tracks, it is generally no longer suitable for applications with high performance expectations. Whenever a defective block is being accessed, the read/write actuator has to move to an alternate position and this requires extra time.

The *Grown Defects* counter records the number of media defects that have occurred since the device was first operated with an IIR controller. A hard disk is in good condition when it has 0 grown defects. Any value greater than 0 indicates a grown defect condition. For more information on grown defects see [Section 10.5.2.4, View Defects/Status](#).

Last Status information should always be 0x00000000. After a device failure or other significant events, a different value may be displayed here. This value is volatile and is reset to 0x00000000 after each power up and/or reset.

Select a hard drive from the Hard Disk Information screen and press <Enter> to view additional information on the SCSI parameter settings.

Figure 10-112. Hard Disk Information

```

Hard disk Information
Name .....: SEAGATE ST39204LC
Capacity .....: 8718 MB

Sync. Transfer .....: Enabled
Sync. Transfer Rate : 80.0 MB/s
Sync. Transfer Mode.: ST
Data Path Width ....: Wide
Domain Validation ..: On
Disconnect .....: Enabled
Disk Read Cache ....: On
Disk Write Cache ...: On
Tagged queues .....: On

Grown defects .....: 0
Last status .....: 0x00000000

```

10.6.4 Save Information

Use the *Save Information* menu option to save the configuration information of the selected IIR controller and its devices in an ASCII file. See [Figure 10-113](#). Such system information/documentation would be helpful should you require support.

Figure 10-113. Save Information

```

View Information
Intel(R) Storage Console -- Version 2.00 - Jul 18 2001
=====
Date/Time:      Tue Aug 07 17:39:18 2001
Operating system: Windows 9x/NT/2000, Version: 5.00, Rev. 2195
Driver version: 3.02
Processor:      x86 Family 6 Model 8 Stepping 3
Physical memory: 130540 KB

Controller Information
=====
Type:           SRCU32
Firmware version: 2.32.00-R002
Features:       C 0 1 4 5 10
Cache:          On
Slot/Address:   0/1
Serial no.:     00FF7DF8
Channel count:  2
Delayed Write:  On

```

At the end of this ASCII file (Figure 10-114) is a reverse chronological listing of boot messages and other events stored in the Flash-RAM of the IIR controller. The log is a good source of information for analyzing complex events and problems. If the buffer is full, the oldest events are deleted first.

Figure 10-114. Screen Service Messages and Async. Events

```

Intel(R) Storage Console -- Version 2.00 - Jul 18 2001
Copyright (C) 2000-2001 Intel Corporation

View Information
=====
Screen service messages / Async. events
=====
Tue Aug 07 18:03:28 2001: Array Drive 5: parity build finished successfully
Tue Aug 07 18:03:28 2001: Array Drive 0: parity build finished successfully
Tue Aug 07 17:36:42 2001: Array Drive 0: parity build started
Tue Aug 07 17:36:32 2001: Array Drive 0: parity build finished successfully
Tue Aug 07 17:36:19 2001: Array Drive 0: parity build started
Tue Aug 07 17:36:11 2001: Array Drive 0: parity verify done
Tue Aug 07 17:36:01 2001: Array Drive 0: parity verify started
Tue Aug 07 17:35:24 2001: Array Drive 0: parity build finished successfully
Tue Aug 07 17:35:10 2001: Array Drive 0: parity build started
Tue Aug 07 17:34:20 2001: Array Drive 0: parity build finished successfully
Tue Aug 07 17:34:06 2001: Array Drive 0: parity build started
Tue Aug 07 16:46:55 2001: Array Drive 3: drive build finished successfully
Tue Aug 07 16:29:29 2001: Array Drive 3: drive build started
Tue Aug 07 16:29:28 2001: Array Drive 0: parity build finished successfully
Tue Aug 07 16:17:06 2001: Array Drive 0: parity build started

```

Note: In the Advanced Setup mode, the Configure Controller menu has a *Clear Log Buffer* option to clear the saved information.

Storage Console Plus

11

11.1 Introduction

Storage Console Plus (StorCon+) is a tool for setting up, monitoring and maintaining mass storage subsystems based on the IIR controller. Different from Storage Console, StorCon+ is a GUI style application, designed for the operation under Win32 Operating Systems. The primary function of StorCon+ is to help the user accomplish the following tasks.

Setup Hard Disks Controlled by the IIR Controller

- Setup and initialize physical drives, change the SCSI parameters and cache settings.
- Easy setup and installation of single disks or array drives consisting of one or more physical drives (chaining, RAID 0, 1, 4, 5 or 10).
- Online installation of host drives based on a single disk or an array drive.

Maintenance and Tuning of Existing Array Drives, Host Drives and the IIR Controller

- Cache Memory Configuration
- Change the device parameters
- Check or recalculate the parity data of RAID 4 and RAID 5 array drives
- Online capacity expansion of array drives
- Split and merge host drives
- Hot Plug. Replace a failed member of an array drive
- Hot Fix. Configure a spare disk for an array drive
- Configure SAF-TE compliant enclosures

Monitoring of the Whole Subsystem

- Watch the performance and throughput of virtually every part of the subsystem. Simply drag-and-drop the device on the statistics window.
- Check the hard disks for retries and reassigns (replacements of defective sectors on a hard disk) to trace problems which might become potential in the future.
- Check the grown defect table of the hard disks to replace a defective drive in time.

Remote Configuration and Maintenance

- Except for the hot plug function, all of the above features can be accessed via network. You can maintain and monitor a customer's server via the Internet.
- Supported protocols: IPX/SPX, TCP/IP, NetBIOS
- The access to the IIR controller can be protected by password. The password is encrypted.

To install StorCon+, use the IIR controller tools program on the RAID Software Suite System CD-ROM.

11.2 The StorCon+ Controls

11.2.1 The Toolbar

The toolbar can be made visible or hidden by selecting “Toolbar” from the “View” menu.

Figure 11-115. StorCon+ Toolbar



Click on the buttons to open and close the windows of the corresponding programs of StorCon+.

The toolbar can be moved away from the top of the StorCon+ window and shown in a small window. To place the toolbar back under the menu bar you can double click on the top window bar of the toolbar or drag and drop the toolbar back under the menu bar. You can also place the toolbar on the bottom of the StorCon+ window.

Table 11-15. Toolbar Icons








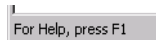
Icon	Opens / Closes	Description
	Select Controller	Select a local or remote IIR controller for further actions.
	Physical Configuration	Show and/or modify the IIR controller and device settings.
	Logical Configuration	Show and/or modify the logical drive configuration.
	Statistics	Show statistics.

Table 11-15. Toolbar Icons

	Events	Show the IIR controller events.
	Help	Shows help information on StorCon+.
	Context Sensitive Help	Enables context sensitive help for the window area for which you want online help.

11.2.2 The Status Bar

The status bar at the bottom of the main window displays status information on the icon or the menu option the mouse pointer is currently placed on. The status bar can be displayed or hidden by selecting 'Status Bar' from the View menu.

Figure 11-116. Status Bar


11.2.3 File Menu Commands

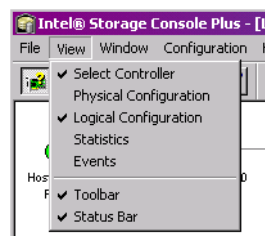
Use the File -> Exit command to end your StorCon+ session. Shortcut: Press <Alt>+<F4>.

Figure 11-117. File Menu


11.2.4 View Menu Commands

Use the items in this menu to open or close the windows of the main components of StorCon+ or change the appearance of the main window.

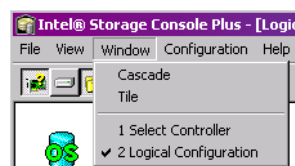
Figure 11-118. View Menu



11.2.5 Window Menu Commands

These commands allow you to arrange the windows in the StorCon+ application window or to activate an open window.

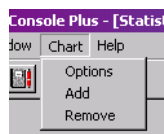
Figure 11-119. Window Menu



11.2.6 The Chart Menu

The chart menu appears when you open the Statistics window. Here you can add and remove data sources and configure the chart.

Figure 11-120. Chart Menu



11.2.7 The Configuration Menu Commands

The Configuration menu appears when you select the Physical Configuration window (see [Figure 11-121](#)) or the Logical Configuration window (see [Figure 11-122](#)).

Figure 11-121. Physical Configuration Menu

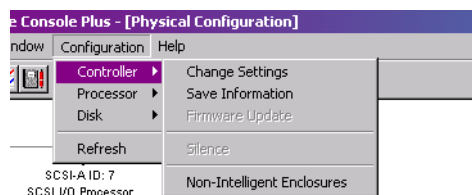
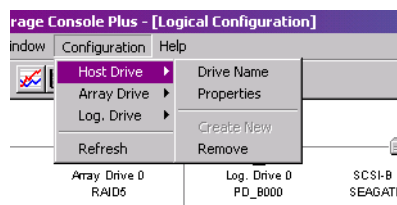
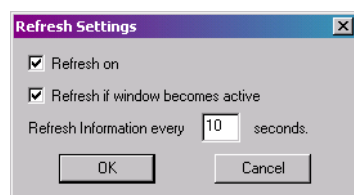


Figure 11-122. Logical Configuration Menu



Set the refresh rate for the Physical or the Logical Configuration windows by selecting the Refresh option from the Configuration menu. StorCon+ uses the selected refresh rate to update the contents of the Physical Configuration and Logical Configuration windows. See [Figure 11-123](#).

Figure 11-123. Refresh Rate Settings Dialog



These menu options are also available if you click the right mouse button on the corresponding icon in the Physical Configuration or the Logical Configuration windows. See [Table 11-16](#).

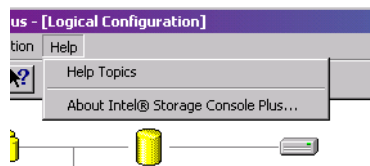
Table 11-16. Configuration Menu Refresh Settings

Option	Description
Refresh on	Activates and deactivates the window update.
Refresh if window becomes active	Update the window if it becomes active.
Refresh information every ... seconds	Sets the frequency for automatic window refreshes.

11.2.8 Help Menu Commands

Use the Help menu to access online help and to get the version of StorCon+.

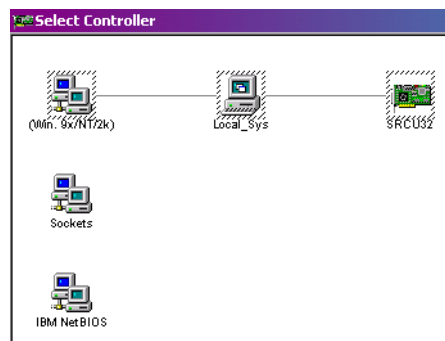
Figure 11-124. Help Menu



11.3 Select Controller

The Select Controller window is used to select an IIR controller for all further actions within StorCon+. See [Figure 11-125](#).

Figure 11-125. Select Controller



Select the desired protocol (Windows NT/95*/98*, Sockets, IBM* NetBIOS*) for the communication between StorCon+ and the system equipped with the IIR controller by double clicking on the *protocol icon* on the very left side of the window (see [Figure 11-126](#)). If you want to select an IIR controller via TCP/IP (sockets), type in the corresponding TCP/IP address or the server system's name (see [Figure 11-127](#)). Enter a user name and password (see [Figure 11-128](#)). This information is transmitted with encryption.

After you select the protocol, select the system which contains the IIR controller and then the IIR controller itself. The selection and de-selection is done by double clicking on the IIR controller. The selected protocol, system and IIR controller are shown in a dashed square frame.

Figure 11-126. Select Controller

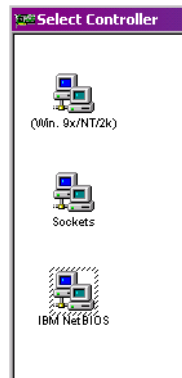


Figure 11-127. Sockets

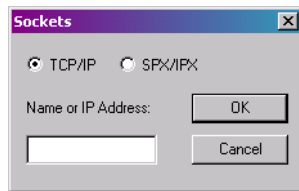
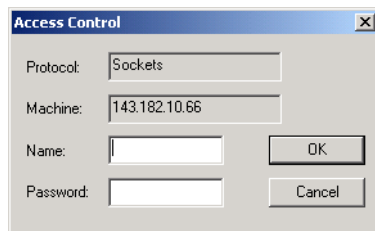


Figure 11-128. Access Control



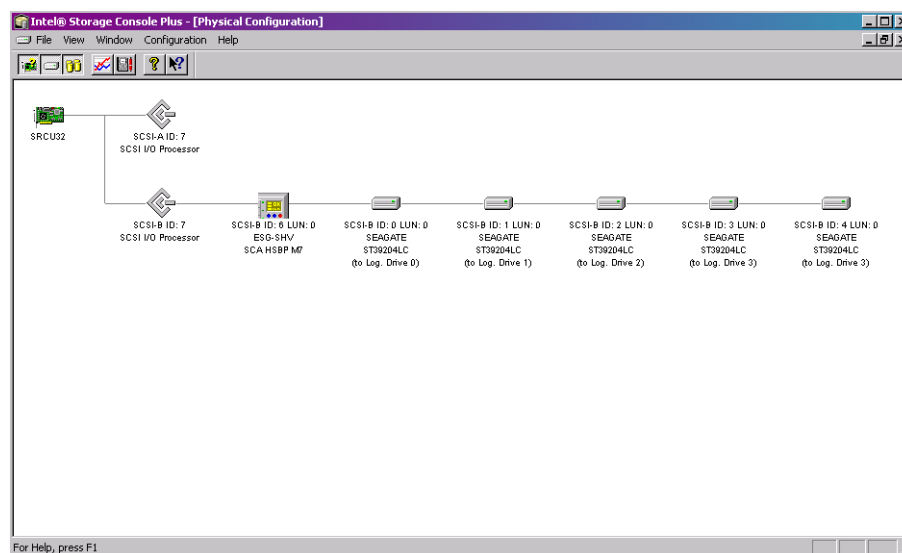
11.4 Physical Configuration Window

The *Physical Configuration* window shows the physical configuration of the SCSI channel busses of the selected IIR controller and the devices connected with these busses. Click on the Physical Configuration icon to open the window. See [Figure 11-130](#) for an example of a Physical Configuration window.

Figure 11-129. Physical Configuration Icon



Figure 11-130. Example of a Physical Configuration and the Controller Settings

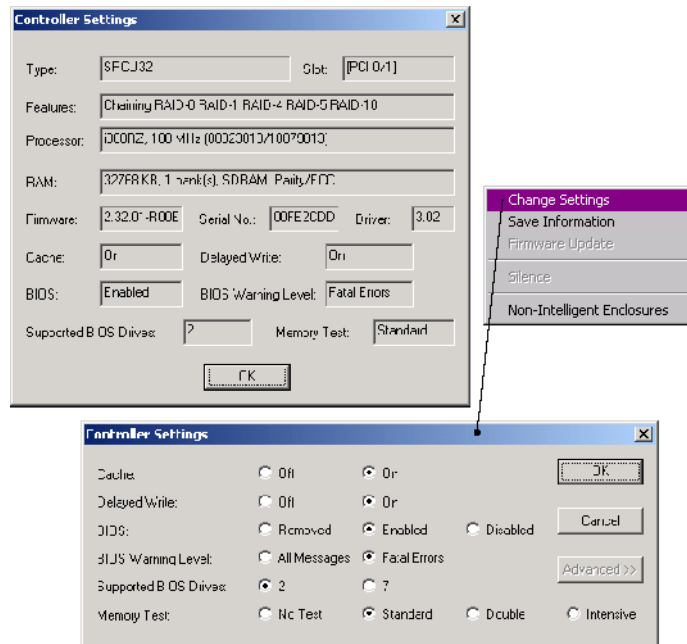


Double click on the icon shown in [Figure 11-131](#) to get detailed information on the selected controller (see the left most Controller Settings dialog in [Figure 11-132](#)). Right click on the icon to see a submenu with the following options: *Change Settings*, *Save Information*, or (configure) *Non-Intelligent Enclosures* (you can also get to this submenu by selecting the controller icon and choosing the Configuration menu -> Controller submenu at the top of the Physical Configuration window). These configuration setting selections are described below.

Figure 11-131. Controller Icon



Figure 11-132. Controller Settings Dialogs



11.4.1 Controller Configuration Settings

11.4.1.1 Change Settings

To change the physical configuration of the controller, right click the controller icon and select *Change Settings*. See Figure 11-132. The controller settings are described in Table 11-17.

Table 11-17. Controller Settings

Setting	Description
Cache	Enables or disables the IIR cache. For optimum performance, the cache should be always On.
Delayed Write	Enables or disables the write cache function of the IIR cache. For optimum performance, the write cache should be always On.
BIOS	The BIOS of the IIR controller is needed to boot the computer and the operating system from a host drive.
BIOS Warning Level	Enables or disables the display of non-critical boot messages of the IIR controller during the system boot phase.
Supported BIOS Drives	Adjust the number of host drives which are supported by the IIR BIOS. This is the number (2 or 7) of host drives which are available under DOS without loading a special driver.
Memory Test	Configures the strategy and duration of the IIR cache memory test during the boot phase. A more intensive test requires more time.

11.4.1.2 Save Information

Right click the controller icon and select *Save Information*. See [Figure 11-132](#).

This option opens a file dialog allowing you to specify the path and name of the Save Information file. This file has a standard ASCII format and can be viewed or printed with a text editor or word processing system.

The Save Information file contains all relevant information on the IIR controller (including firmware version, cache size, connector assignment, termination assignment), the connected devices (for example, firmware version, SCSI parameters, selected transfer rate, number of grown defects, last status information), the logical drives, array drives and host drives. Thus, it represents an easy and effective way to create a detailed document of the IIR controller(s) and disk array(s).

The Save Information file can also be very helpful for a remote diagnosis of a system. If a trained support person has a copy of this file (by fax or by e-mail), it can be used to bring the system back to full operation.

11.4.1.3 Non-Intelligent Enclosures

Right click the controller icon and select *Non-Intelligent Enclosures*. See [Figure 11-132](#).

This option displays a Configure Enclosures dialog that allows you to configure or edit the enclosures available with your system.

11.4.2 I/O Processors

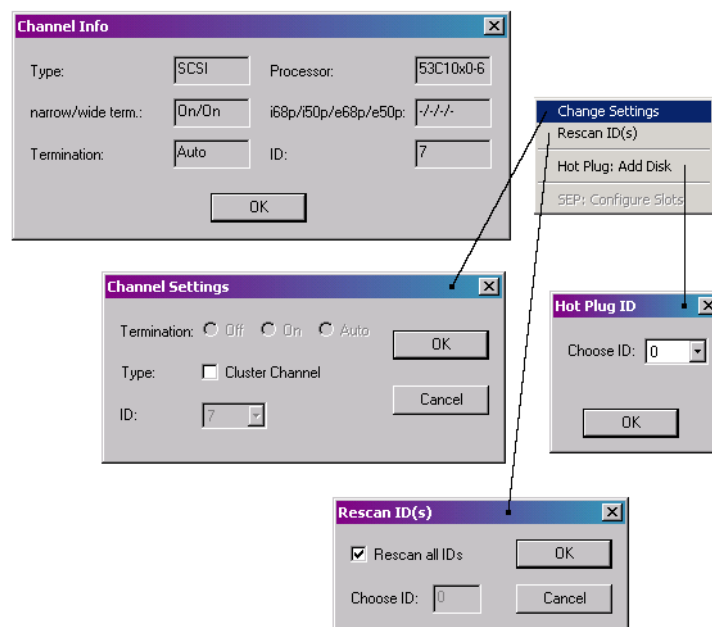
I/O processors of the IIR controller are represented in the Physical Configuration window in [Figure 11-130](#) and in [Table 11-18](#). Each processor controls one I/O channel.

Table 11-18. I/O Processor Icons

Icon	Description
	SCSI processor SE (single ended)
	SCSI processor LVD/SE (low voltage differential / single ended)

Double click on the processor icons (shown in [Table 11-18](#)) to get channel information on a processor (see the channel info dialog in [Figure 11-133](#)). Right click on the icon to *Change Settings*, *Rescan ID(s)* or do a *Hot Plug: Add Disk*. See [Figure 11-133](#) (you can also get to this submenu by selecting the processor icon and choosing the Configuration menu -> Processor submenu at the top of the Physical Configuration window). These selections are described below.

Figure 11-133. Processor Information



11.4.2.1 Channel Settings

Termination

The termination for this channel of the IIR controller can be set to three different states:

ON: The termination of the lower (low byte) and upper data lines (high byte) is enabled or disabled depending on the occupied SCSI connectors of this channel.

OFF: No lines are terminated

AUTO: All 8/16 data lines are terminated.

Warning: The SCSI bus termination of the IIR controller must match the existing SCSI cabling and cable termination. If the IIR controller represents one end of the SCSI bus, its termination must be ON or AUTO. If you change the termination to OFF, it is likely that the SCSI bus will be unstable and the connected devices may fail.

ID

Changes the SCSI ID of the SIOP (0-7).

11.4.2.2 Rescan ID(s)

This function allows you to rescan one or all ID's of the selected SCSI channel. It displays an overview of all powered SCSI devices which are currently connected with the SCSI bus.

Warning: If the hard disk contains valid host drive or array drive information, it will be deleted when creating new logical drives. All data will be lost.

11.4.2.3 Hot Plug: Add Disk

With the hot plug function you can add a new hard disk while the system is running. Before starting the hot plug procedure, you should prepare the new hard disk and set the jumpers according to the free SCSI IDs and SCSI bus termination. Ensure the correct termination of the SCSI bus and set the ID of the hard disk to a free address if that is not done automatically by your storage subsystem. If you do not know which IDs are in use on the selected SCSI channel, you can find this out in the Physical Configuration window. Wrong SCSI bus termination and/or SCSI ID conflicts will cause a failure of the complete SCSI channel.

During the hot plug procedure enter the ID of the new hard disk (all free IDs are offered) and then confirm a security request. Thereafter the SCSI channel is halted. While the channel is halted, you have 45 seconds to plug in the new hard disk. (Note: Since the operating system will time out, the channel cannot be halted longer). If you do not complete the hot plug procedure manually, the channel will automatically start again after 45 seconds. After the successful completion of the hot plug, the new physical drive appears in the Physical Configuration window. You can use it to build a new host drive, replace a failed drive or expand an existing array drive. You should only use the hot plug function with servers and/or subsystems which are designed and certified for hot plugging of hard disks.



Warning: If the new plugged-in hard disk contains valid host drive or array drive information, they will be deleted when creating a new logical drive. All data will be lost.

11.4.3 Direct Access Devices

Direct access devices can be initialized and subsequently used for logical drives. The IIR caches the I/Os of these devices. Logical drives are the components of array drives. These devices are represented in the Physical Configuration window in [Figure 11-130](#) and in [Table 11-19](#).

Note: If you want to change the media of a removable disk during operation, the media **MUST NOT BE INITIALIZED** with StorCon or the StorCon+. Also, these devices have to be reserved for the raw service. Thus, the removable disk is handled like a non-direct access device.

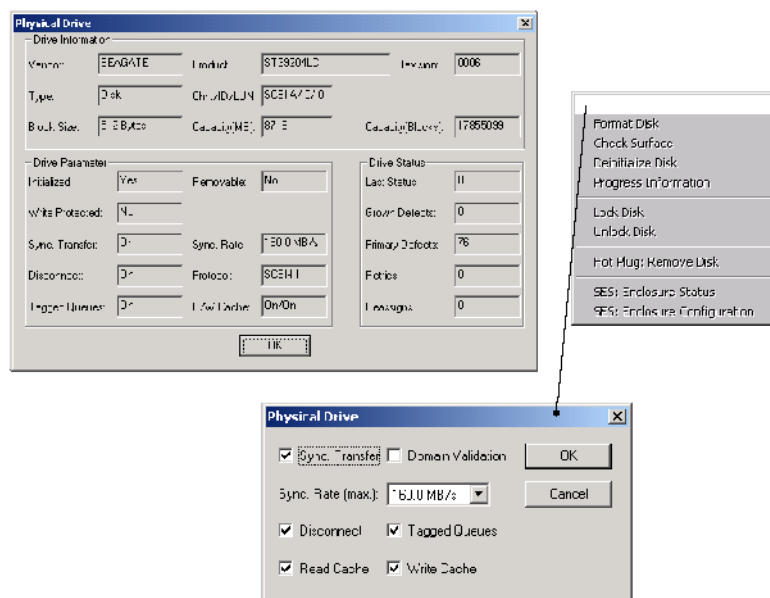
Table 11-19. Direct Access Device Icons

Icon	Description
	Physical Disk
	Removable Disk

Double click on the processor icons (shown in [Table 11-19](#)) to get the Physical Drive window (see [Figure 11-134](#)). Right click on the icon to open the submenu with the following options (see [Figure 11-134](#)): *SCSI Parameter/Initialize*, *Format Disk*, *Check Surface*, *Deinitialize Disk*, *Progress Information*, *Lock Disk*, *Unlock Disk*, *Hot Plug: Remove Disk*, *SES: Enclosure Status*, and *SES: Enclosure Configuration* (you can also get to this submenu by selecting the controller icon and choosing the Configuration menu -> Disk submenu at the top of the Physical Configuration window).

Depending on the disk configuration, the submenu options may or may not be disabled. The selections are described below.

Figure 11-134. Physical Drive Information



11.4.3.1 The SCSI Parameter/Initialize

The SCSI parameters configure a physical drive (especially its performance).

Note: Refer to the accompanying Hardware Guide to determine which of the following parameters are configurable.

By changing the SCSI parameters, you can

- Enable or Disable Synchronous Transfer
- Enable or Disable the Domain Validation (only if IIR controller has Ultra160 SCSI channels)
- Set the Synchronous Transfer Rate
- Enable or Disable the Disconnect Feature
- Enable or Disable the Tagged Queues
- Change the Settings of the Hard Disk Read and Write Cache

Warning: By changing these parameters on a new hard disk or a hard disk which has been connected to a non-compatible RAID controller, the hard disk will be initialized and all data on the hard disk will be lost.

You can access the change SCSI Parameters / Initialize menu by clicking the right mouse button on a physical drive in the Physical Drives Windows (View > Physical Configuration).

Synchronous Transfer and Synchronous Transfer Rate

Different from the older asynchronous transfer mode, synchronous transfer offers higher transfer rates on the SCSI bus. The maximum synchronous data transfer rate depends on the width of the SCSI bus (8 bit narrow SCSI, 16 bit wide SCSI) and the frequency of the signals on the SCSI bus (10 MHz for Fast SCSI, 20 MHz for Ultra SCSI and 40 MHz for Ultra2 SCSI and Ultra160 SCSI). The maximum data transfer rates are shown in Table 11-20.

Table 11-20. Data Transfer Rates

	Narrow SCSI (8Bit)	Wide SCSI (16Bit)
Fast SCSI	10 MB/s	20 MB/s
Ultra SCSI	20 MB/s	40 MB/s
Ultra2 SCSI	-	80 MB/s [†]
Ultra160	-	160 MB/s [†]
[†] (LVD SCSI (low voltage differential) only)		

Note: The maximum synchronous data transfer rate between a SCSI device and the IIR controller can be limited. This limitation may become necessary if a particular SCSI cabling does not allow the maximum rate the controller and the drive could achieve. Adjust the synchronous transfer rate in the SCSI parameters / Initialize menu.

Note: To select a transfer rate above 10 MB/s the protocol must be set to SCSI-III. Higher frequencies (single ended SCSI) require better cabling, shorter cables and a professional termination of the SCSI bus.

Domain Validation

Domain Validation is a cyclical check of the correct data transfer at a given rate for IIR controllers with Ultra160 SCSI channels. Normally this parameter is Off.

Disconnect

This SCSI feature enables a SCSI device to disconnect from the SCSI bus. By releasing the SCSI bus while the device doesn't need it, the bus becomes free for other devices to transfer or receive data. An example of a disconnect situation is a hard disk that needs time to read data from its media after receiving a read command. It may then disconnect from the SCSI bus so that other devices can transfer data. Later on it reconnects when it is able to deliver the data instantly. You can change the disconnect setting for a hard disk in the SCSI parameters / Initialize menu.

Tagged Queues

This feature enables modern hard disk drives to receive several commands at one time and then process them in an optimized order. A few, mainly older drives, do not support this feature. You can change the tagged queues setting for a hard disk in the SCSI parameters / Initialize menu.

SCSI Read Cache / SCSI Write Cache

These settings enable or disable the write and read caches of the hard disks. Turning these caches OFF degrades the performance of the hard disk. You can change the cache settings of a drive in the SCSI parameters / Initialize menu.

11.4.3.2 Check Surface

Warning: This option destroys all data on the hard disk.

This option checks the surfaces of the selected hard disk media. The IIR controller writes and reads certain data patterns and checks them for correctness.

After you choose the *Check Surface* option, StorCon+ displays a warning that performing this command will destroy all data. Press <Y> to do a surface check or press <N> to cancel. If you choose to do the surface check, StorCon displays a progress information bar with the elapsed time and estimated time of completion. You can interrupt the surface check by clicking the Cancel button.

11.4.3.3 Deinitialize Disk

De-initializing a physical drive removes the initialization sectors. The physical drive cannot be a member of a logical drive once it is deinitialized.






11.4.3.4 Lock Disk / Unlock Disk

With this function you can lock or unlock a removable drive containing a removable medium. If the physical drive is locked, the medium cannot be ejected with the eject button while the system is running.

11.4.4 Non-Direct Access Devices (Raw Devices)

Non-direct access devices cannot become components of logical drives, array drives or host drives. These devices are either controlled by a software driver (for example, an ASPI module), the operating system or an application. Non-direct access devices cannot be initialized or configured in StorCon+.

Table 11-21. Non Direct Access Devices

Icon	Description
	CD-ROM / CDR
	Tape drive
	SAF-TE-Processor
	Scanner
	SCSI Printer

11.5 Logical Configuration Window

The Logical Configuration window shows the logical configuration of host drives, array drives and logical drives controlled by the selected IIR controller. The complete configuration is shown as a tree starting from the left with the host drives, followed by the array drives the logical drives and the physical drives. See the Logical Configuration window in [Figure 11-144](#). Click on the Logical Configuration icon ([Figure 11-135](#)) to open the window.



Figure 11-135. Logical Configuration Icon



To get detailed information on a drive, double click on an icon (shown in [Table 11-22](#)). The window that opens depends on the type of the selected device. To change the logical configuration of a drive, click the right mouse button on the desired drive or select an option from the Configuration menu. Drive types are described below.

11.5.1 Host Drives

Table 11-22. Host Drive Icons

Icon	Description
	Host Drives. Double click to open information on a drive. Right click to change the logical configuration of a drive.
	Create a New Host Drive. Double click to create a new host drive.

11.5.1.1



Normal Host Drive

This host drive belongs to the selected IIR controller on a non clustering I/O channel.

11.5.1.2



Local Mounted Cluster Drive

A Local Mounted Cluster Drive is a host drive on a clustering I/O channel. This host drive is mounted on the selected IIR controller on a local server.

Note: Refer to the accompanying Hardware Guide to determine if clustering is supported on this IIR controller product.

Clustering means that two or more servers share resources. If one server fails its resources move to another valid server. The hard disks used for clustering are physically connected not with just one IIR controller, but with several IIR controllers in different servers (shared I/O channels).

Only one server can own a host drive at the same time, so a host drive configured for clustering may either be controlled by the selected IIR controller (for example, local mounted) or by a different IIR controller (for example, remote mounted). You may only change the configuration of a local mounted host drive.



11.5.1.3

Remote Mounted Cluster Drive

A *Remote Mounted Cluster Drive* is a host drive on a clustering I/O channel. This host drive is mounted on an IIR controller in a different server.

Note: Refer to the accompanying Hardware Guide to determine if clustering is supported on this IIR controller product.

Clustering means that two or more servers share resources. If one server fails its resources move to another valid server. The hard disks used for clustering are physically not connected with just one IIR controller, but with several IIR controllers in different servers (shared I/O channels).

Only one server can own a host drive at the same time, so a host drive configured for clustering may either be controlled by the selected IIR controller (for example, local mounted) or by a different IIR controller (for example, remote mounted). You may only change the configuration of a local mounted host drive.



11.5.1.4

Private Host Drive Belonging To Another IIR Controller

This is a host drive on a clustering I/O channel. This host drive is configured as a private host drive and does not belong to the selected IIR controller. A private host drive cannot be used for clustering.

Note: Refer to the accompanying Hardware Guide to determine if clustering is supported on this IIR controller product.

Clustering means that two or more servers share resources. If one server fails its resources move to another valid server. The hard disks used for clustering are physically not connected with just one IIR controller, but with several IIR controllers in different servers (shared I/O channels).





Usually, when booting a cluster, the IIR controller starting up first will gain control over all host drives on the clustering I/O channels. If you want to be sure that a host drive is controlled by a specific server, you may configure this host drive as a private host drive. A private host drive cannot be used for clustering.

You cannot change the configuration of a private host drive which does not belong to the array of the selected IIR controller. You must use StorCon to change its configuration. A private host drive belonging to the selected IIR controller is displayed like a normal host drive.

11.5.2 Array Drives

Note: Array drives consist of logical drives. They can be fault tolerant, depending on the RAID level. The RAID level is displayed under the array drive icon. Double click on an icon to get more information on the state of an array. See [Figure 11-136](#). Right click the desired drive to select an array drive option.






Table 11-23. Array Drive Icons

Icon	Description
 <p>Idle</p> <p>Build</p> <p>Ready</p> <p>Fail</p> <p>Error</p>	<p>RAID 4/5/10</p> <p>Right click to select a drive option.</p> 
 <p>Build</p> <p>Ready</p> <p>Fail</p>	<p>RAID 1</p>
	<p>RAID 0</p>

11.5.3 Logical Drives

Logical drives consist of one or more physical drives.


Table 11-24. Logical Drive Icons

Icon	Description
 Single Disk  Hot Fix Drive  Failed / missing Hot Fix or Single Disk  Chaining Drive	<p>Right click to select a drive option.</p> 

11.5.4 Physical Drives

Physical drives are hard disks. Setting changes are not possible here. If you want to change the settings, you must do so in the Physical Configuration window.

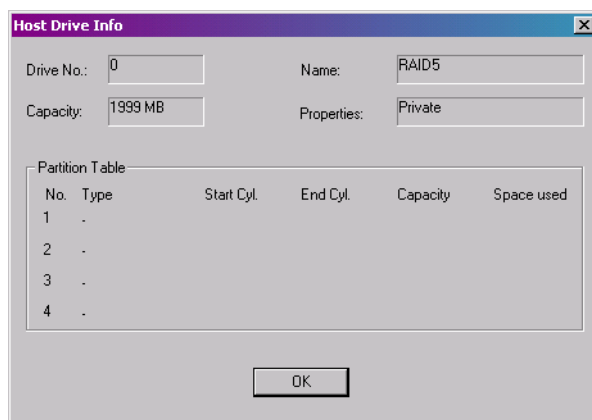
Table 11-25. Physical Disk Icon

	Physical Disk	Use the Physical Configuration window to change disk settings.
---	---------------	--

11.5.5 The Host Drive Information Window

Double click on the icon for an existing host drive. This window contains information on the selected host drive. See [Figure 11-136](#).

Figure 11-136. Host Drive Information Window

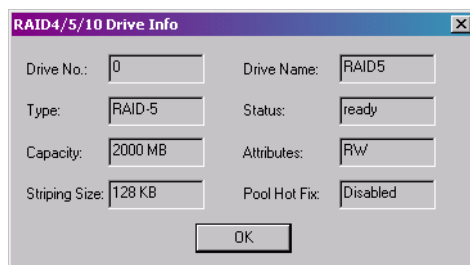


Drive No	The host drive number. The host drives are reported to the system in order, beginning with the lowest Drive Number. If the corresponding IIR controller is the first controller in the system, the system will boot from the host drive with the lowest number.
Name	The name of the host drive. A host drive is automatically given a name during the configuration. It can be renamed by selecting the menu Drive Name of the menu list you get after clicking with the right mouse button on the host drive icon.
Capacity	The host drive capacity reported to the operating system. The size of a host drive can be smaller than the size of the logical drive or the array drive the host drive is a part of.
Partition Table	The partition table of a host drive can contain up to four partition entries. Partition type, it's location on the host drive, it's size and the percentage of space used by this partition are shown.

11.5.6 The Array Drive Information Window

Double click on the array drive icon. This window shows information on an array drive (for example, a disk array). See [Figure 11-137](#).

Figure 11-137. Array Drive Information Window

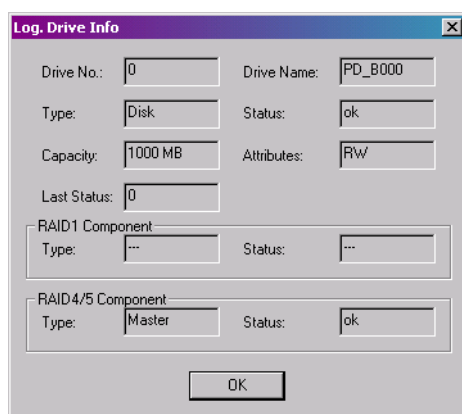


Drive No	The logical number of the array drive.
Drive Name	The name of the array drive.
Type	RAID level of the array drive. Possible levels are RAID 0 (data striping, no redundancy), RAID1 (mirroring), RAID 4 (striping with parity drive), RAID 5 (striping with striped parity) or RAID 10 (combination of RAID 1 and RAID 0).
Status	The status of an array can be <i>ready</i> (operational), <i>fail</i> (one drive missing, still operational but not redundant), <i>error</i> (more than one drive failed, not operational), <i>rebuild</i> (one drive is being integrated), <i>build</i> (initial preparation of the array), <i>idle</i> (new defined array, before build process has started), or <i>expand</i> (one or several drives are added online to the array drive).
Capacity	This is the capacity available for the corresponding host drives.
Attributes	The attribute of an array drive is usually read/write ([RW]). If a component of a disk array is missing during startup and the operator decides not to activate fail mode, the array is set to the read only attribute ([RO]). When the missing drive becomes available, the array drive shows the ready status (for example, attribute [RW]).
Striping Size (RAID 0, 5, 10)	Data written on RAID 0, 4, 5 or RAID 10 drives is distributed over all drives (striping). The striping size can only be changed at the time the drive is created (standard setting is 32KB).
Invalid/Missing (RAID 1)	These two values show the number of invalid/missing drives. In this condition invalid drives exist during the build process (initial copy of data from the master to the slave).
Pool Hot Fix	Indicates when the pool hot fix access is enabled or disabled. A pool hot fix drive is a spare drive within the so-called hot fix pool. A drive in a hot fix pool is available for several array drives as a hot fix drive (assuming it has appropriate capacity). Thus, several array drives can share one hot fix drive. Once this drive has been used by one of the array drives, it is no longer available for the others. Hot fix drives can also be configured as private hot fix drives. A private hot fix drive can only be used by the array drive it was configured for. The pool hot fix access can be changed by clicking with the right mouse button on the array drive icon.

11.5.7 The Logical Drive Information Window

Double click on the logical drive icon. This window shows information on a logical drive. A logical drive can be either a single disk, or a chaining group of disks (concatenation), or a stripe set of several disks. See [Figure 11-138](#).

Figure 11-138. Logical Drive Information Window



Drive No	The number of the logical drive.
Drive Name	The name of the logical drive.
Type	The type of the logical drive. A logical drive can be either a single disk, or a chaining group of disks (concatenation), or a stripe set of several disks.
Status	This is the state of the logical drive. It can be <i>ready</i> , <i>missing</i> (not available after reset) or <i>failed</i> (for example, no longer available for the controller).
Capacity	The available capacity of array drives or host drives.
Attributes	The attribute of a logical drive is usually read/write ([RW]). If a component of a disk array is missing during startup and the operator decides not to activate fail mode, the array is set to the read only attribute ([RO]). When the missing drive becomes available, the array drive shows the ready status (for example, attribute [RW]).
Last Status	The last status information of a logical drive. This is different from the last status information of physical drives.
RAID 1 Component	If the logical drive is a member of a RAID 1 array, it can be either master or slave. If a RAID 1 component is added to a logical drive, the data is read from the master and written to the added logical drive (the slave). One master may have several slaves.
RAID 4/5 Component	As a member of a RAID 4 or RAID 5 array a logical drive can be the master or a component. Different from RAID 1 arrays, this is only important for the internal structure of the array.

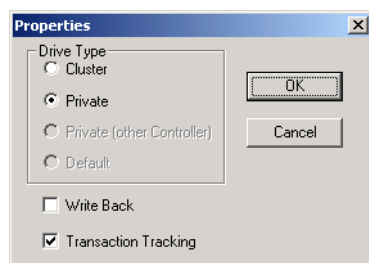
11.5.8 Drive Name

Click the right mouse button on the icon for a host drive, array drive, or logical drive. This menu option opens a dialog for entering a new name for the selected drive (up to 7 characters).

11.5.9 Properties (of a Host Drive)

Click the right mouse button on a host drive icon. This menu option opens the Properties window (see [Figure 11-139](#)). You can view and configure the Drive Type, Write Back, and Transacting Tracking properties.

Figure 11-139. Properties



11.5.10 Remove (a Host Drive)

Click the right mouse button on the host drive icon. By selecting this menu item you can delete a host drive.

Warning: When deleting a host drive, all other host drives which are part of the same array drive or logical drive, the array drive or logical drive itself and all its components are deleted. ALL DATA WILL BE LOST.

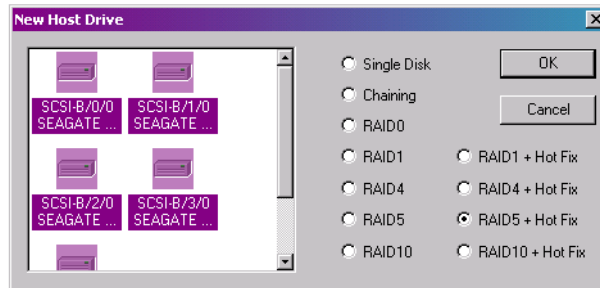
To prevent the operating system from crashing and to hinder the unintentional deletion of drives, all partitions on the host drive (and its related host drives if it is split into several host drives) must be deleted before the host drive can be removed.

11.5.11 Create New (Host Drive)

Double click on the new host drive icon.

Only host drives are “visible” to the operating system. The underlying structure of the host drives is not known to the operating system. The operating system does not recognize that a given host drive consists of a number of hard disks forming a disk array. To the operating system this host drive simply appears as one single hard disk with the capacity of the disk array. This complete transparency represents the easiest way to operate disk arrays under any operating system. Neither the operating system nor the computer need to be involved in the administration of these complex disk array configurations. To create a new host drive, you need one or more physical drives which are not yet part of another host drive. After double clicking on the new host drive icon, the New Host Drive window opens. See [Figure 11-140](#).

Figure 11-140. New Host Drive



On the left side of the window are the available physical drives. Under the drives you can see their physical coordinates (channel/ID/LUN), the manufacturer, and the vendor-unique name. On the right side you see a list of all possible host drive types which can be configured. When there is no physical drive selected in the left box, all possibilities are disabled. While selecting physical drives for the new host drive, more attributes become selectable.

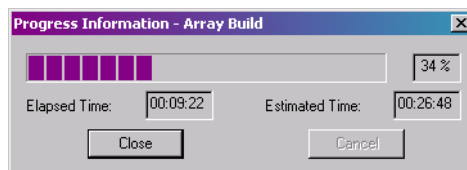
You can select a single physical drive by clicking on it. If you want to select more than one physical drive, simply draw a frame around the physical drives, or press the <Ctrl> key and then click on all the physical drives you want to combine to a new array.

When you have finished the selection of the physical drives, choose the type of host drive you want to create and click on OK.

If the selected host drive uses data striping (RAID 0, 4, 5 or 10) you can change the default striping size. If you have selected a configuration with hot fix drives, you can choose between a private hot fix drive or a pool hot fix drive. After the host drive is created, you can partition and format the host drive with the corresponding operating system utility.

If an array build has begun, you can monitor the progress of the array build by clicking the right mouse button on the host drive and then selecting progress information. See [Figure 11-141](#).

Figure 11-141. Array Build Information Dialog



11.5.12 Parity Verify

Click the right mouse button on the array drive icon.

RAID 4 and RAID 5 drives contain parity information, which is used in the event of drive failure. The parity information is calculated from the user data on the disk array. On RAID 4 disk arrays the parity data is stored on a single disk (parity disk), on RAID 5 disk arrays the parity data is distributed over all drives (parity striping). This option verifies online the parity information of the selected RAID 4 or RAID 5 array drive. If this option is selected for several array drives, the processes are put into a queue and performed one after the other.

If a parity error is detected, find the reason for the data corruption. A good indication of data corruption can be retries on the SCSI bus. If the retry-counter shows high numbers, this might be the problem. Possible reasons for parity error are bad cabling, termination or hardware error from a defective drive or an overheated drive. After removing the reason of the data corruption you can carry out parity recalculate to ensure that the parity information of this disk array becomes valid.

Figure 11-142. Parity Verify

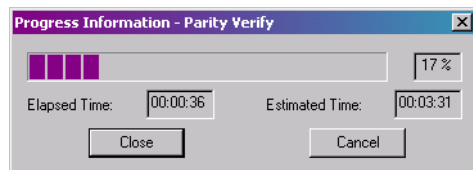


11.5.13 Progress Information

Click the right mouse button on the array drive or physical drive icons.

The progress information window shows the progress (elapsed time, estimated time, percentage of completion) of a parity verify, a disk array build, or a surface check. During an array drive rebuild, the information (user data and/or parity) of a specific logical drive is calculated from the user data and parity information of the other logical drives and written to this new logical drive. During a build of an array drive parity information is calculated and written to a specific logical drive (RAID 1/4) or striped over the array drive (RAID 5).

Figure 11-143. Parity Verify Progress Information



11.5.14 Expand Array

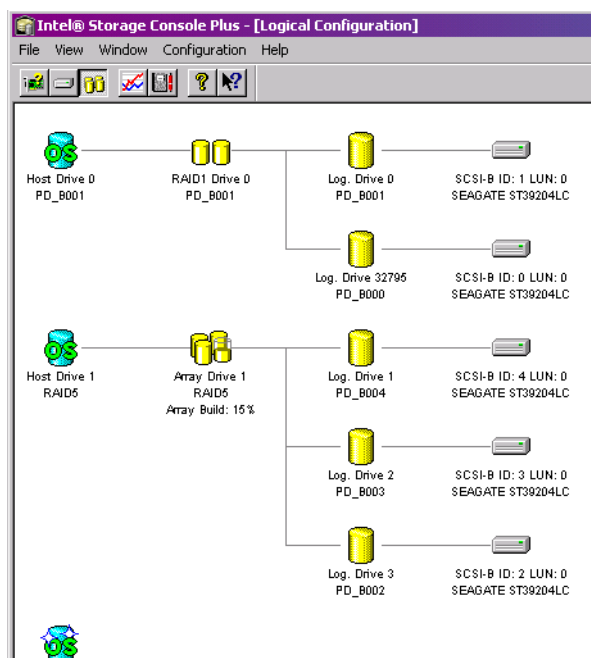
Click the right mouse button on the array drive icon.

There are two functions that are available within this option:

- migrate the RAID level of the selected RAID array drive (RAID 0 => RAID 4 and vice versa, RAID 0 => RAID 5 and vice versa) and/or
- expand the capacity of the selected array drive by adding one or several new hard disks.

Both functions can be selected at the same time. For example, migrate from RAID 0 to RAID 5 and add a new drive. To initiate a migration or expansion with a RAID 4/5 array drive, the state must be ready. The data on the array drive remain intact and are not affected by the expansion. The additional capacity is introduced as a new host drive. If a logical drive fails during the expansion, the expansion process continues until the expansion is finished. The array drive changes into the fail state. The new capacity is available as a new host drive. Windows NT (Tool: Disk Administrator) and Novell NetWare ("Scan for new Devices" and then Tool: Install) allow the online integration of new disk capacity. Depending on the RAID level the current array drive has, selecting a different one will cause the Migration of the RAID level of the array drive. If you select the same RAID level, the following procedure will expand the capacity of the array drive only.

Figure 11-144. Logical Configuration



If you want to add additional drives to the array drive, select them from the box on the left side of the window. It is possible to add more than one drive at a time.

If no physical drives are offered, you have to use the *Hot Plug: Add Disk* function first, to add new drives. You can open the progress information window to monitor the progress of the expansion. If you have previously limited the capacity of the array drive, you are asked if you want to convert this free space to a new host drive.

Caution: Before starting an expansion it is absolutely necessary to back up all data on the system. If the expansion process includes a new, unknown hard disk and there are problems with this disk or with the cabling of this disk, then there is a risk of data

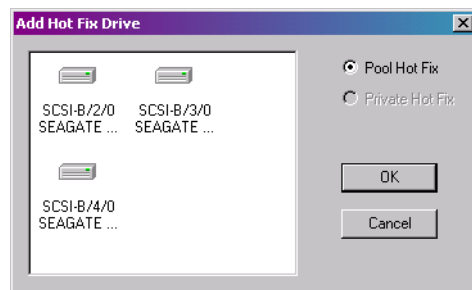
loss. Some expansions take a long time, so it is advisable that there be a minimal amount of traffic on the system.

11.5.15 Add Hot Fix

Click the right mouse button on the array drive icon.

Use this option to add a hot fix drive to an array drive (RAID 1/4/5/10). Add a *private hot fix* drive or a *pool hot fix* drive. Private hot fix drives are assigned to a specific array drive and are activated if a member of this array drive fails. Pool hot fix drives can be used by any array drive with pool hot fix access enabled. RAID 1 array drives allow only pool hot fix drives. After choosing the type of hot fix drive, you can select a physical drive from the box that shows all suitable drives.

Figure 11-145. Add Hot Fix Drive



The capacity of the hot fix drive has to be larger or equal than the capacity of the components of the array drive. For example: The logical drives of the array drive have 4.2GB capacity, thus the capacity of the hot fix drive has to be 4.2GB or larger.

The spindle motor of the hot fix drive is normally stopped (for example, when the hot fix drive is not needed). Thus, it may take a few seconds to get a response when you click on that drive.

Some general notes on hot fix drives.

One of the reasons RAID array drives are used, lies with the data redundancy they provide, that is, the data security you have in the event of a hard disk failure. For the purpose of the following considerations, we define the term *time without redundancy* (TWR) as the time it takes to replace a failed hard drive (assuming there is no hot fix drive installed in the system). The time without redundancy should be kept as short as possible, not including the time needed to set up the array drive (*state build*).

Let us assume that one of the hard disks of a RAID 5 array drive fails. The array drive is without redundancy. TWR begins. Any superfluous prolongation of the TWR (because you have to get a replacement hard disk or because no one checked the file server) increases the risk of data loss should a second hard disk fail. Therefore, new redundancy should be created as soon as possible and in an entirely automated manner. Integrate a hot fix drive as an immediately available and auto-replacing hard disk to keep the TWR as short as possible. Only a hot fix drive can ensure optimal array drive security and constant

data availability. Of course a hot fix drive is not mandatory. If you control the array drive at regular intervals and immediately replace a defective hard disk (by shutting down the system or using a hot fix), you can minimize the risk of data loss.

11.5.16 Remove Hot Fix

Click the right mouse button on the array drive icon.

This option opens a box showing available hot fix drives. Select the hot fix drive you want to remove from the array drive and then confirm your selection. You can remove any pool hot fix drives or a private hot fix drive from the selected array drive.

11.5.17 Hot Fix Pool Access

Click the right mouse button on the array drive icon.

Enable or disable the access of an array drive to the pool hot fix of hot fix drives. If the access is enabled this means that if a member of an array drive fails, a drive can be taken from the hot fix pool and built automatically into the array drive. To be able to activate this feature, there must be suitable logical drives in the hot fix pool. You can add drives to the hot fix pool using the function *Add Hot Fix Drive*. By doing so, the hot fix pool access for this specific array drive is activated automatically. For all other arrays drive you must activate the access manually.

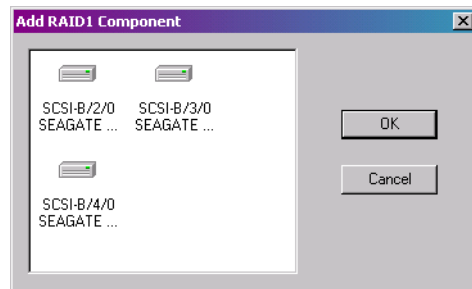
11.5.18 Add RAID 1 Component (Mirror a Drive)

Click the right mouse button on the logical drive icon.

This function allows you to add to a logical drive which is a member of an array drive, another logical drive as a mirror drive (RAID 1).

Example: You have configured an array drive with 4 logical drives. One logical drive has failed and the array drive went into the fail state. Another failure would cause data loss. Unfortunately, you find another logical drive that is likely to fail (for example, you hear a strange noise from it, or it's grown defect counter explodes). If you initiate a hot plug it is likely that the critical logical drive will also fail. To avoid that problem, mirror a new good logical drive to the critical one. When the copying is finished, remove the critical logical drive and carry out a hot plug procedure.

Figure 11-146. Add RAID1 Component



1. To add a RAID 1 component, select a logical drive, the master. All suitable logical drives (with a capacity equal to or larger than the capacity of the master) are shown in a box.
2. Choose the logical drive you want to add, the slave. After confirming, a new RAID 1 array drive is built, for example, all data from the master is copied to the slave drive(s). When this process is finished all logical drives in the RAID 1 array drive are identical (there is no longer a difference between master and slave).

11.5.19 Remove RAID 1 Component (Remove a Mirror Drive)

Click the right mouse button on the logical drive icon.

Here you can remove a drive from a RAID 1 array drive. If the array drive is in the build or fail state, you may only remove invalid RAID 1 components.

To remove a logical drive from a RAID 1 array drive select the logical drive you want to remove. This is done by selecting a logical drive from a box where you see all members of the RAID 1 array drive. After confirmation the logical drive is removed. If the RAID 1 array drive consists of two drives, the RAID 1 array drive disappears and only one logical drive is left. You can create a new RAID 1 array drive by selecting add RAID 1.

11.5.20 Replace Drive

Click the right mouse button on the logical drive icon.

If a logical drive of an array drive without a hot fix drive should fail (or is very likely to fail), you should replace the defective hard disk with a new one as soon as possible, because the array drive is without redundancy. The replacement logical drive has to have at least the same capacity as the failed one. The replacement is carried out with StorCon or the StorCon+. Before the logical drive can be removed, you must select a new logical drive from the box with available physical drives that is shown after this option is selected. If no physical drive is offered, you have to use the Hot Plug: Replace Drive function to add a new drive. After the confirmation, the old logical drive is removed. Next, the data is rebuilt on the new logical drive. During this process the array is in the rebuild state and therefore not redundant.

11.5.21 The Different States of an Array Drive

Some of these states may have the addition of */patch* (for example, build/patch, ready/patch). This indicates that the original array drive. For example, the parity information was recalculated or the array drive has been patched from the error state into the fail state. This may become helpful in a situation where two logical drives of an array drive fail at the same time, but only one of the two logical drives is really defective and the other was blocked out since it was connected with the same I/O channel as the defective one. The array drive's state is error and normally all data would be lost. The IIR firmware includes some functions that allow the patch of this array drive from the error state into the fail state. Before the actual patch, the defective drive has to be physically removed from the array drive. Such a patch procedure should only be used after a consultation with a trained support person (a printout of the Save Information file, is extremely helpful).

11.5.21.1 The Ready State

The array drive is fully operational when in the ready state. All redundant information is present, that is, a hard disk can fail without impairing the functionality of the array drive. This is the normal state of an array drive. The ready/expand state indicates that the RAID level and/or capacity are currently migrated/expanded.

Figure 11-147. The Ready State



11.5.21.2 The Idle State

This state is characterized by the fact that the redundant information of the array drive has never been entirely created. The array drive is in this state after its first configuration. Should an error occur while the array is in the build state, the array returns to the idle state. Exception: if during build mode the dedicated drive of a RAID 4 array drive fails, the state changes to *fail*.

Figure 11-148. The Idle State



11.5.21.3 The Build / Rebuild State

After the array drive has been configured for the first time, and the build process has begun the array drive assumes the build state. While the array drive is in the build state, redundancy information is calculated and stored to the components of the array drive.

The disk array will assume the rebuild state after the automatic activation of a hot fix drive or after a manual replacement (hot plug). The data and the redundant information are reconstructed and stored to the new drive.

While in the build and rebuild states, the array drive is not redundant.

You can monitor the progress of the array build/rebuild by clicking the right mouse button on the host drive and then selecting progress information.

Note: User traffic on an array drive that is in the build/rebuild state, slows down the build/rebuild process.

Figure 11-149. The Build / Rebuild State



11.5.21.4 The Fail State

The array drive changes to the fail state whenever a logical drive fails. Redundancy information is still present, thus allowing the remaining hard disks to continue working. This state should be eliminated as soon as possible by replacing the defective hard disk. This can be done by using a physical drive that is already connected with the controller, but not yet used for a logical drive, with the replace drive function, or by using the Hot Plug: Replace Drive function. If a hot fix drive has previously been assigned to an array drive, the IIR controller will automatically replace the defective drive and start the reconstruction of the data and the redundant information. Therefore, under these circumstances the fail state is only temporary and will be eliminated by the controller itself.

Use the last status from the physical drive information to analyze the cause of the drive failure. Additionally, check for retries and/or reassigns.

A drive failure may also be the result of bad cabling, wrong termination or overheating.

Figure 11-150. The Fail State



11.5.21.5 The Error State

Should a second hard disk fail while the array drive is in the fail or rebuild state, it is not possible to continue the working session without restrictions. The disk array is still available for I/Os, but data loss and error messages on the host level are possible.

Usually you must remove the array drive and build a new one. In some situations (see below) it might be possible to reset the array.

Use the last status from the physical drive information to analyze the cause of the drive failure. Additionally, check for retries and/or reassigns.

A drive failure may also be the result of bad or cabling, wrong termination or overheating.

Figure 11-151. The Error State



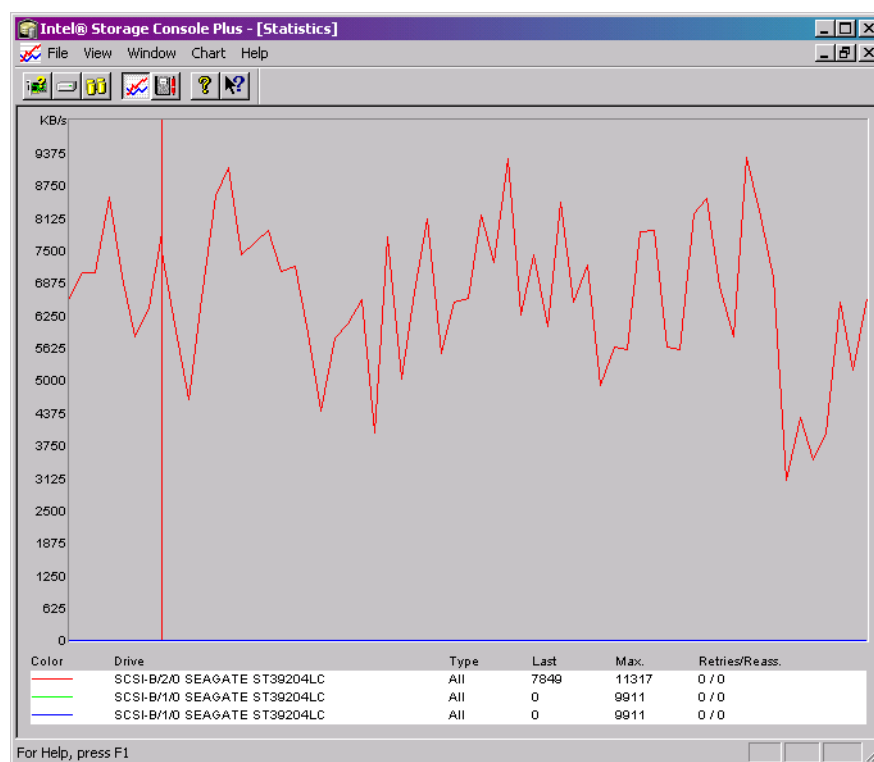
11.6 The Statistics Window

Figure 11-152. Statistics Window Icon



The statistics window displays the throughput of physical, logical and host drives. The vertical axis show throughput, the horizontal axis, time. You can add drives by dragging and dropping them from the physical and logical configuration windows into the statistics window. To change the layout of the lines, adjust the scales of the axis or remove drives from the statistics windows using the chart menu.

Scale the statistics window using the arrow keys. Scale time down/up using the left/right arrow keys. Scale throughput using the up/down arrow keys.

Figure 11-153. Statistics Window

11.7 The Events Window

Figure 11-154. Events Window Icon

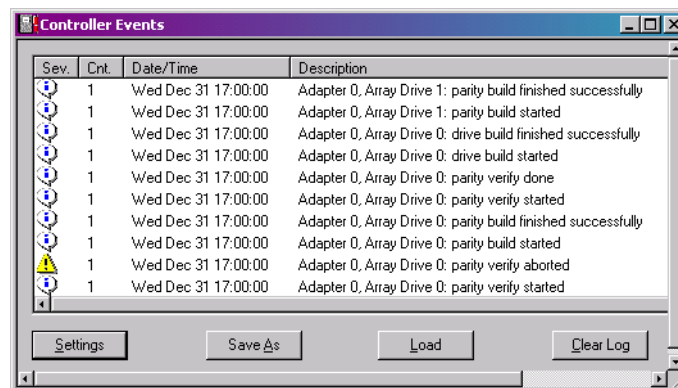
The Controller Events window shows the history of events (since the log was last cleared). The [Table 11-26](#) illustrates the severity of events.

Table 11-26. Event Window Icons

Event Icon	Event Description
	Information: This event is non critical. It occurs, for example, at the completion of an array build.
	Warning: This event is critical. It occurs, for example, if an array drive's state changes from ready to fail.
	Error: An error has occurred. This event could be a drive failure.

[Figure 11-155](#) is an example Controller Events window. The first column in this window contains icons representing the severity of the event. The second column lists how often the event has occurred (note that some events may occur often). The next column lists the date and the time when the event occurred. The last column describes the event. At the bottom of the window there is the Settings button. Here you can change the polling interval and enable the auto save function. Logs that are not saved on the hard disk are lost when the system is reset. The auto save function saves the current log in the time intervals selected. The *Save As* button allows you to write the contents of the event log (of file extension, *.evt) to a specific file on the hard disk. The Load button loads an older event log and displays it. The last two buttons delete the log file and clear the event buffer.

Figure 11-155. Controller Events

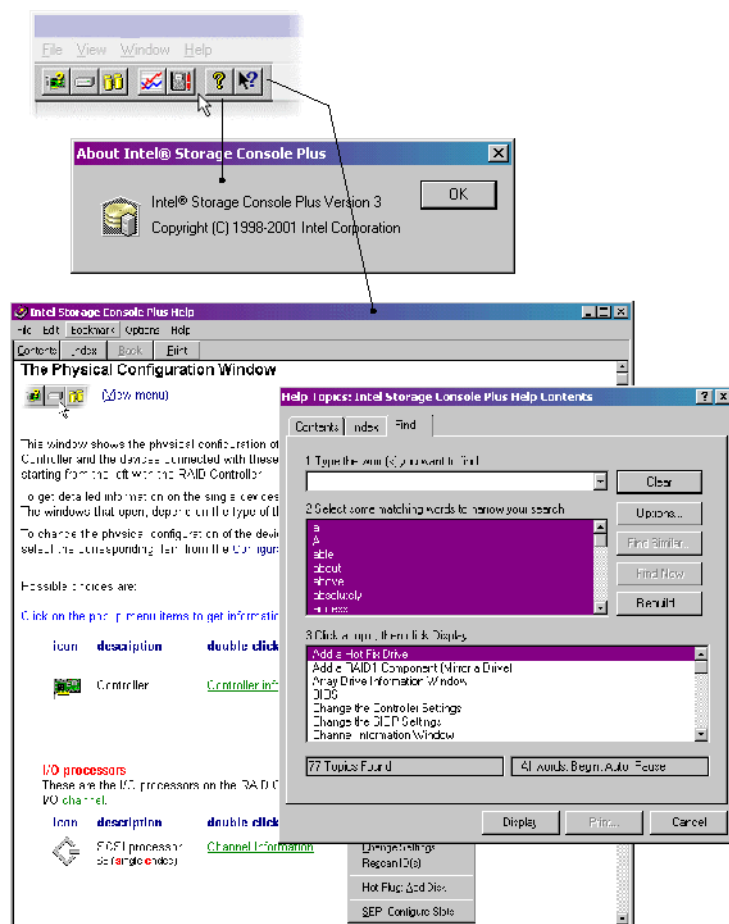


11.8 StorCon+ Help

StorCon+ includes an online help function. You can choose the Help menu or the pointer with the question mark to obtain online help for an icon or function. There is also an index which allows you to search for certain keywords and/or topics.

The Help menu also allows you to view the version of StorCon+.

Figure 11-156. StorCon+ Help



11.9 RAID Configuration Service and RAIDMail

There are additional tools list below which are part of StorCon+ delivery.

RAID Configuration Service	Allows remote access to an IIR controller in a Windows NT server
RAID CTRL	Allows remote access to an IIR controller in a Novell server
RAIDMail	Converts IIR controller messages into standard mails (for Windows 9x/NT, MAPI format)

It is recommended that you install the RAID Configuration Service / RAID CTRL and the RAIDMail tool on each server that is equipped with an IIR controller. Thus, remote access to IIR controllers in a network can be easily managed from one or several authorized users.

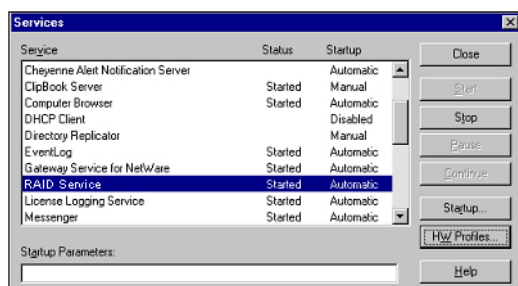
1. To install the RAID Configuration Service under Windows NT, copy RCSSRV.EXE and RAIDSrv.CPL into the winnt\system32 directory and from the command line load

```
.. \RCSSRV -i
```

2. In the control panel load the “services” program and activate the RAID Configuration Service with the Start button.

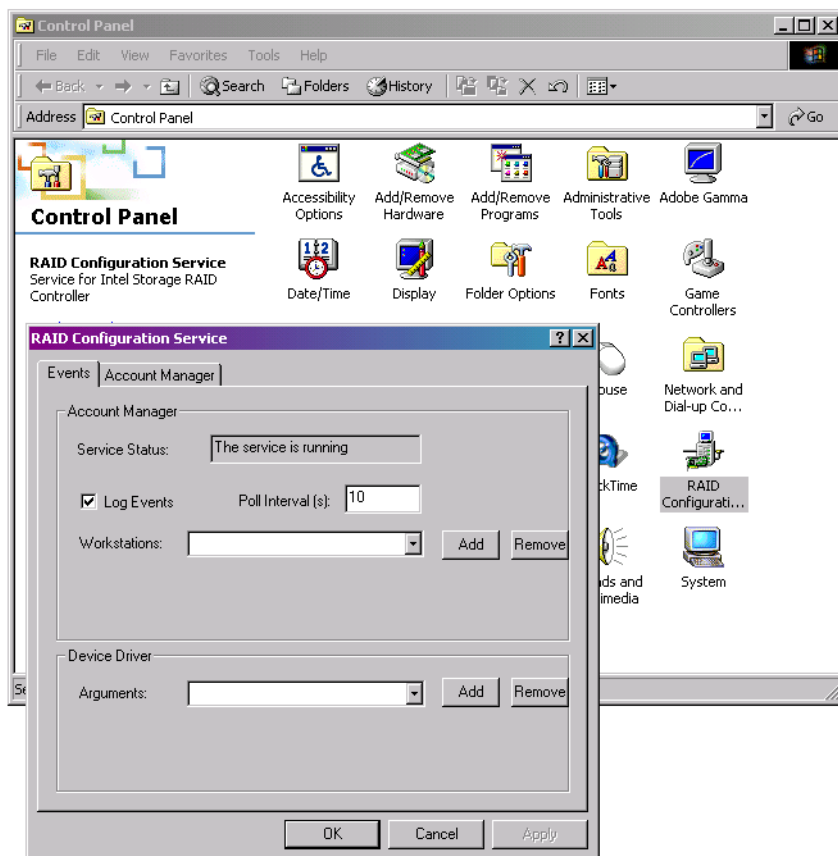
To start the RAID Configuration Service during every new boot of the system automatically, click on the Startup button. See [Figure 11-157](#).

Figure 11-157. Services

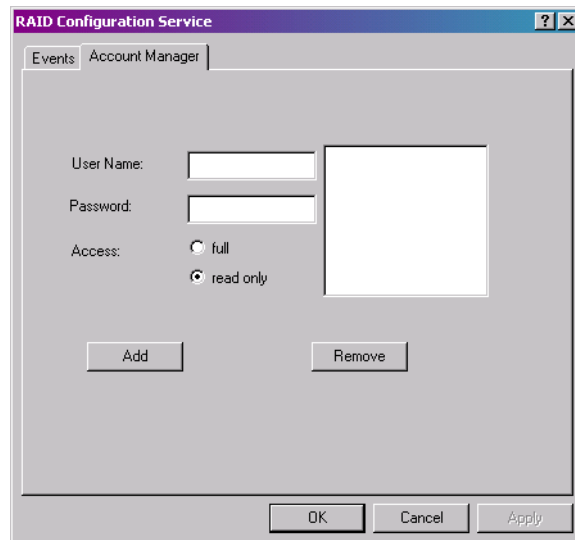


To configure the RAID Configuration Service double click on the RAID Configuration Service icon. See [Figure 11-158](#).

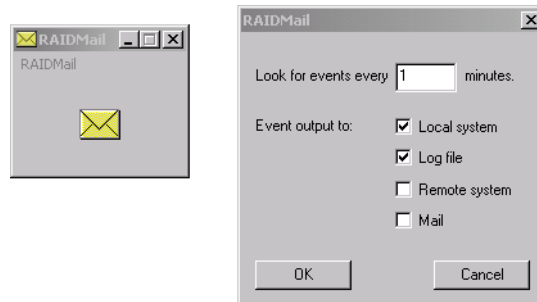
- The Poll-Interval determines the time between two message acquisitions of the RAID Configuration Service.
- Under Workstation you can add workstations which receive broadcast messages from the IIR controller.
- In the device driver section you can add or remove parameters for the RAIDSRC.SYS driver (for example, reserve parameters for raw devices).

Figure 11-158. RAID Configuration Service

In the IOCTLSrv property sheet you can add / remove users which have remote access to the IIR controller via StorCon+. Passwords are encrypted. See [Figure 11-159](#).

Figure 11-159. RAID Configuration Service

The RAIDMail tool gathers messages from the RAID Configuration Service, generates standard mail messages and sends them to pre-defined workstations. See [Figure 11-160](#).

Figure 11-160. RAIDMail

After loading RAIDMAIL.EXE and selecting “Settings”, configure the mail tool.

If you select “Local System” all messages are displayed on the server itself. If you select “Log file”, you are asked for a log file path/name. See [Figure 11-160](#). All messages are recorded into this file ([Figure 11-161](#)). “Remote System” allows you to add workstations to which messages are sent. See [Figure 11-162](#).

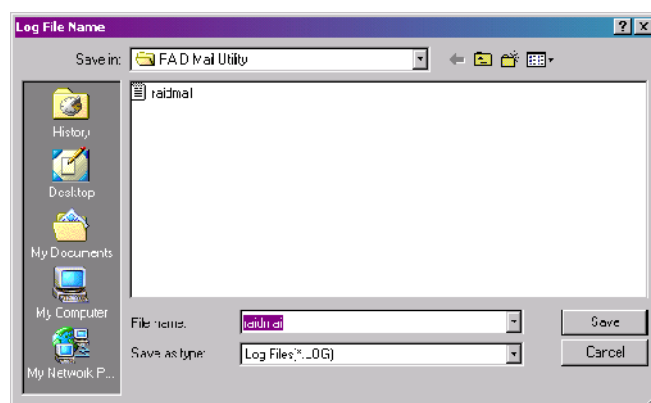
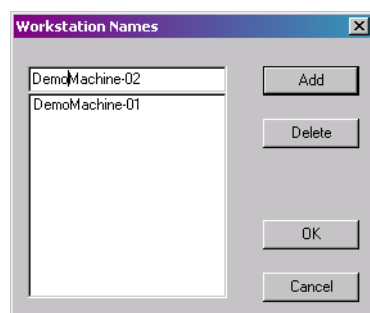
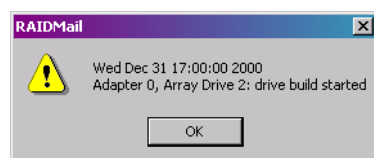
Figure 11-161. Log File Name**Figure 11-162. Workstation Names**

Figure 11-163 illustrates a typical message generated by RAIDMail. The “Mail” option allows the interfacing to a standard mailing system (like Microsoft Outlook* or Exchange*).

Figure 11-163. RAIDMail Utility

Optional Features

A

[Appendix A, Optional Features](#) provides instructions for server clustering with Microsoft and Novell operating systems and provides an overview of PCI Hot Plug. Refer to the Hardware Guide of the specific IIR controller to determine whether the optional features described in this chapter are supported.

A.1 Server Clustering

In today's information technology world, high availability systems are gaining greater and greater importance. The demands on these systems are not only the continuous availability of important data, for example, 365 days x 24 hours, but also efficient resource sharing of expensive components. The secret behind *clustering* is the intelligent combination of many computer systems to increase the security and computing power of the whole system. A cluster appears to the user as one single system with extraordinary characteristics. Clustering software controls and manages the cluster and its members.

There are several strategies when designing clustering systems. In the first model, the members (also called nodes) are connected to each other through a LAN. In another model, the nodes share an I/O bus. Host-based RAID controllers are ideally suited for cluster systems designed to avoid *single points of failure* (the components that cause a system failure when they fail). The choice of host-based RAID controllers for the nodes of a cluster system implements the appropriate redundancy and security in the mass storage part of the system. In contrast, external RAID controllers carry the risk of becoming single points of failure.

Successful installation of a clustering system requires experience installing Microsoft Windows NT/2000 Server, Microsoft Cluster Server, Novell NetWare, and IIR controllers. Information about the operating system, the functioning of the cluster and other system details may be found in their respective operating system manuals. For information about the installation of the IIR controller and the configuration of disk arrays, refer to the RAID user documentation.

A.1.1 IIR Controllers in a Cluster Configuration

Due to required cable lengths (several meters) for the shared I/O channel(s) and the demands on transfer performance and quality, only Wide/Ultra2 SCSI and Ultra160 SCSI controllers are suitable for clustering. Using such controllers allows for sufficient distances between the two servers and the RAID enclosure.

For the successful installation and setup of clustering systems, note that computer systems, RAID Controllers, mass storage enclosures *and* accessories of suitable quality, such as cables, terminators, SCSI Bus Repeaters, and Isolators or Converters are all important.

A.1.2 Hardware Installation

Wide/Ultra2 SCSI or Ultra160 SCSI channels which are used as a shared I/O bus require 2 SCSI Wonder Ultra160s per shared channel to ensure that the shared channel will work even if a server is switched off, or if the bus is separated from the IIR controller in one of the servers.

A.1.3 Using Wide/Ultra2 and Ultra160 SCSI IIR Controllers

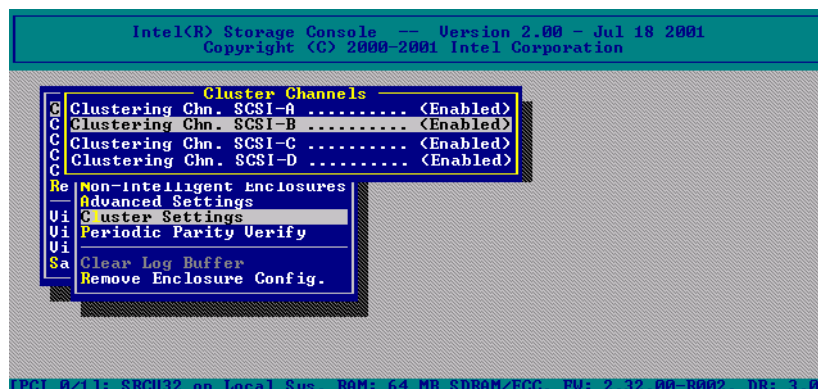
Both IIR controllers for the two nodes should be identical (same model, same firmware level).

Before connecting both controllers to the shared I/O cable, one of the IOPs (In-put/Output Processor) on one of the controllers must be set to another SCSI ID for example, ID6. This should be done for all I/O channels which are used as Clustering channels. The easiest way to change the IOP IDs is to use StorCon (Storage Console) loaded with <Ctrl>+<G> from the controller's ROM.

A.1.4 Releasing the Cluster Channels

Those channels which are used as shared channels for Clustering have to be released and marked as Clustering channels within the Storage Console (press <Ctrl>+<G> at system boot level when the IIR BIOS is displayed.). This applies to all IIR controllers participating in the shared channel(s).

Figure A-1. Cluster Channels



A.1.5 The Microsoft Cluster Server Concept

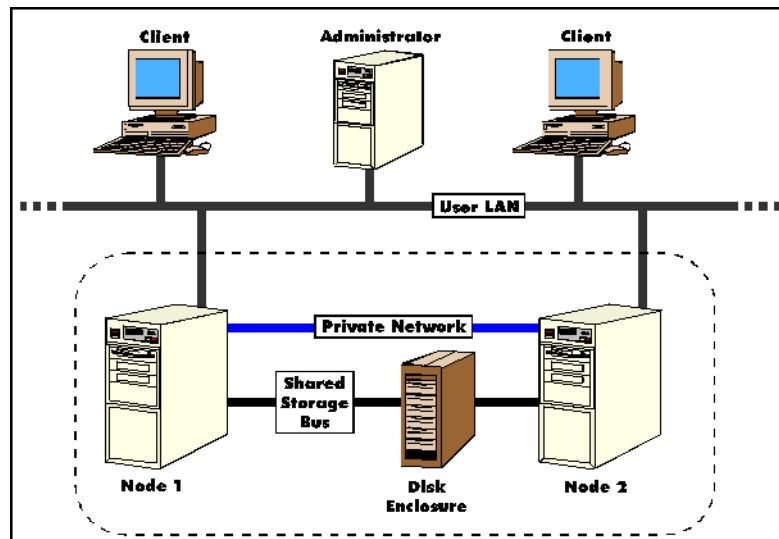
A Cluster Server is always made up of 2 individual Windows NT/2000 Servers, called Nodes. Both of these Nodes should at least be linked to a commonly used Shared Storage Bus. Ultra2 SCSI and Ultra160 SCSI Controllers are suitable for these kinds of links as these technologies enable the configuration of sufficiently long I/O bus systems.

There must be a Quorum Resource on the shared storage bus. This can be a drive, a partition or a subdirectory. This resource is a kind of information exchange area which are used by both Nodes. An MSCS can not be configured or started without this kind of Quorum Resource. In addition to this resource, other or more disk arrays are normally configured as shared user data hard disks. These disks must be NTFS formatted.

If one of the Nodes fails, the remaining server can take over its tasks. The application which is being carried out on the failed disk is then restarted on the second Node. The application has to be installed on both server systems. Possible temporary data or information are stored on the Quorum Resource. Corresponding cluster supporting applications can carry on the tasks from the point where the failed Node has stopped via these data and a corresponding API (Application Programming Interface). Other applications can simply be started anew.

The whole process (take over of tasks for the other Nodes) is classed as a Failover by Microsoft.

Figure A-2. Microsoft Clustering



Furthermore, applications can operate on various Nodes, ensuring that all available resources are used to the optimum. An application can not run on both Nodes at the same time (Load Balancing). Microsoft therefore defined this as Static Load Balancing, for example, a static distribution of resources. Dynamic load balancing is not possible at the moment. A speed advantage is only possible if, for example, two different applications are running in parallel on different Nodes of a cluster server (for example, a Web Server on Node 1 and an SQL database server on Node 2).

Both Nodes can communicate with each other via the normal network (User LAN). It is possible to link the Nodes with an additional network (Private Network).

Microsoft urges the user to use two Interconnects (1 Public Network as User LAN and a Private Network for the Nodes) for OEMs with original MSCS equipment. The diagram on the previous page shows this kind of configuration.



A software RAID solution (for example, the NT build-in) is not supported. Therefore, data that is on the hard disks of the shared storage bus must be protected by hardware RAID controllers. Microsoft recommends using suitable hardware RAID controllers for protecting data. It is important for these controllers that the RAID configuration data is stored on the disks and not in an NVRAM. This guarantees that even if a controller fails, or after a controller has been exchanged, the RAID configuration still remains intact.

A.1.6 Novell Netware Clustering

A.1.6.1. Hardware Requirements and Settings

Note: Ensure the IIR controllers are equipped with firmware that supports clustering. Refer to the Hardware Guide for firmware versions that support clustering.

Observe the points below during hardware setup:

- All IIR controllers which control shared Cluster Drives, have to be connected with each other on all IO-channels which host shared drives.
Example 1: Two IIR controllers control a shared RAID 5 Array which consists of three hard disk drives. These three drives are on the same IO-channel. In this example both IIR controllers have to be connected with this IO-channel.
Example 2: Two IIR controllers control a shared RAID 5 Array which consists of four hard disk drives, where two drives are connected with IO-channel A and the other two with IO-channel B. In this example both IIR controllers have to be connected with both IO-channels.
- It is highly recommend that you use external high quality hot pluggable disk enclosures. These units should support SAF-TE.

The boot system and operating system should be isolated from the shared storage. You could think of a separate RAID 1 protected array drive.

Note: It is highly recommended that you install cluster array drives.

To setup a cluster array drive which will contain NCS Cluster volumes, follow these rules:

- With the exception of one server unit, all other server units of the Cluster should be switched off. On this server unit the Cluster array drive receives its initial setup.
- At system boot level of this one server unit press <Ctrl>+<G> to enter the ROM-resident StorCon program.
- Choose the “Configure Host Drive” menu. At a certain point of the setup procedure StorCon will ask you if the newly created host drive should have the type “Cluster”. Confirm with “y” for yes.
- If you are not sure if the hard disk drives you use will protect their cache from data loss in case of a Bus reset, switch off the writes caches of these drives. Use the “Configure Physical Devices” menu within StorCon.
- Cluster array drives of IIR controller’s are protected against any kind Controller failure with a “Transaction Tracking” system. This system is activated by default. If this feature is not desired (for example, because of performance reasons), it can be switched off. To accomplish this, all server units of the cluster except one have to be switched off.

A.1.6.2. Installation of Netware OS and Cluster Services

Please make sure that you install the latest versions of Netware 5.1, the corresponding Service Packs and the Netware Cluster Services. If you are not sure which versions you have and whether they are up-to-date or not, please contact your local Novell distributor or visit Novell's web site (www.novell.com).

In any case simply follow step-by-step the Installation Notes for the Netware Cluster Services from Novell.

Important: Even though it will take more time, never try to install several servers simultaneously. From our experience there is a very high probability that the Cluster will not work in the end. Thus, fully install server-by-server (except the NCS, which is installed later from a client). After each installation restart the server. After this restart switch on the next server and begin with the installation there, etc.

Please make sure that the AUTOEXEC.NCF files of all servers of the Cluster contain the following lines:

```
...
LOAD TCPIP.NLM FORWARD=NO
...
NSS /AUTODEACTIVATEVOLUME=ALL
...
```

You should also change the Error Handling settings (for example, with MONITOR.NLM) into:

```
AUTO RESTART AFTER ABEND = 0
```

A.1.6.3. The Netware Client

Active-Active Failover capability under Windows NT and Windows 2000 requires an application (for example, SQL server) which is designed for that scenario. Thus, a standard application (for example, a simple copy job) will fail and terminate with an error message in an active-active failover situation.

Note: Install on the Client ConsoleOne – a Java Tool (current version) to be able to manage the Netware Cluster.

Note: ConsoleOne running on the server does not support the Netware Cluster Services. With ConsoleOne you can also install the Volume Resources, which appear as Netware Cluster Volumes.

Note: Novell Clustering makes intensive use of the IP protocol. Special care should be taken that all IP addresses (Servers, Clients, Cluster Resources, etc.) are unambiguous.

A.1.6.4. Information on the Active-Active Failover Scenario

Be aware that the Netware Cluster Services (as well as the solutions for Microsoft Cluster Server products) do not represent fully mirrored systems. Thus data loss can occur in case of a server failure with subsequent failover to a backup server.

A.1.6.5. The Netware Driver and the Tool StorCon.NLM

Every released version of the HAM driver (SRCRxxxx.HAM) is suitable for clustering as there are no specific cluster functions in the driver. For a new installation use the latest released version.

The tool StorCon.NLM facilitates the administration of the cluster arrays. Note that a cluster array can only be managed and serviced from one server. Access to this cluster array from other servers (with StorCon running) is not permissible. Normally, this is the server in the cluster which was started first and which has found the cluster array before the other servers. Should this specific server fail, all administration rights are migrated to another, valid server. A server console message notifies the server administrator of this event.

A.1.6.6. Restrictions

Cluster Arrays cannot be expanded online. The Cluster must be shut down (all servers) and the following steps observed:

1. Shut down the Cluster with all its individual servers and switch them off.
2. Switch on only one of the servers and enter StorCon with <Ctrl>+<G>.
3. Change the drive type of the Cluster Array into “Private”.
4. Expand and/or migrate the array and wait until this process is completed.
5. Change the drive type of the Cluster Array back into “Cluster”.
6. Restart the Cluster.

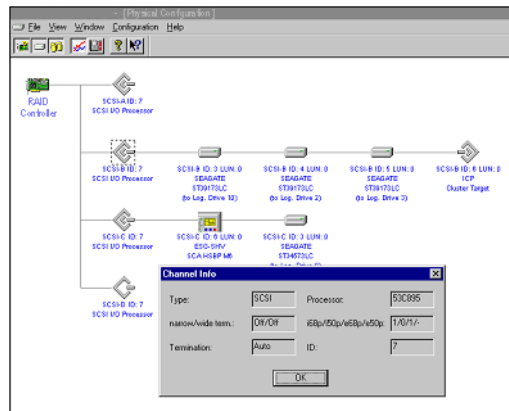
A.1.6.7. Notes on the Storage Console Plus (StorCon+)

A detailed description of the StorCon+ is covered in [Chapter 11, Storage Console Plus](#) of this guide.

Display of shared I/O channels within StorCon+ is illustrated in [Figure A-3](#).

This example shows a shared Wide/Ultra2 SCSI channel with five Wide/Ultra2 SCSI hard disks. Two of the hard disks set up as a RAID 1 disk array and currently mounted on the IIR controller of the other node and are not visible here. You could use the Cluster Administrator for Windows NT/2000 to move this resource back to the displayed IIR controller.

Figure A-3. Channel Information



In Figure A-4, two disk drives within the RAID 1 disk array have been moved to the currently displayed IIR controller.

Figure A-4. Channel Settings

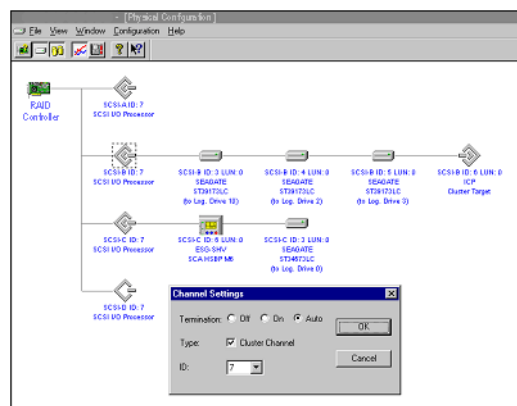


Figure A-5. Cluster Administration

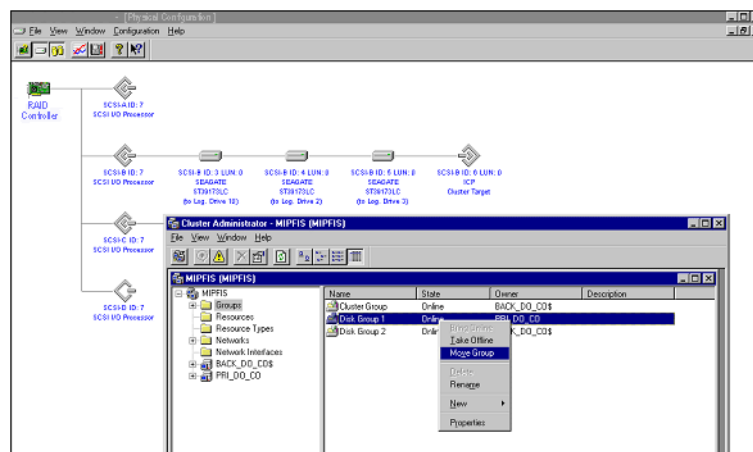
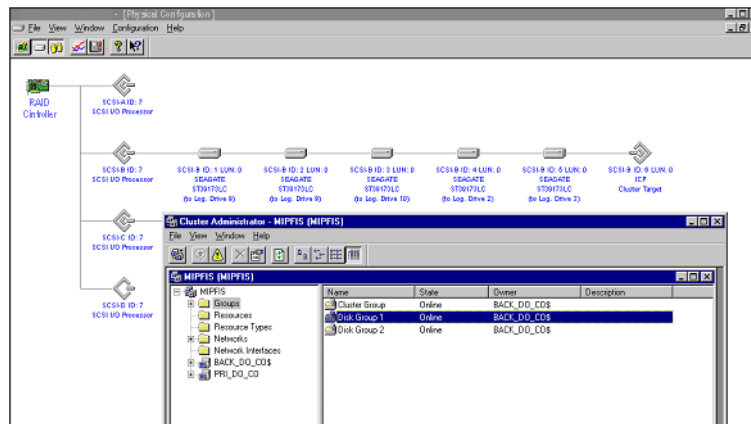


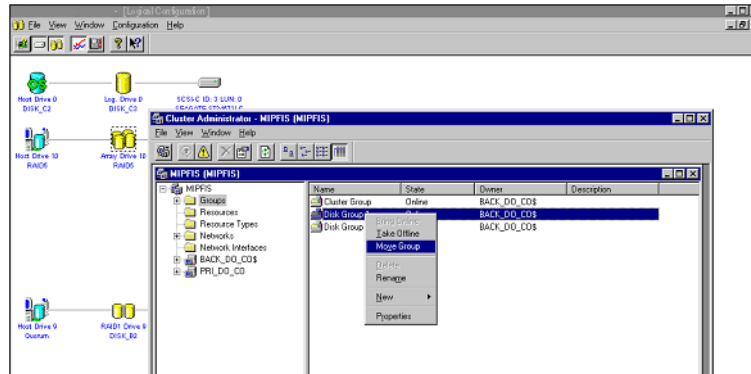
Figure A-6. Cluster Administration



At the logical drive level, the reversed procedure (moving two disk drives back to the other IIR controller) is displayed [Figure A-7](#).

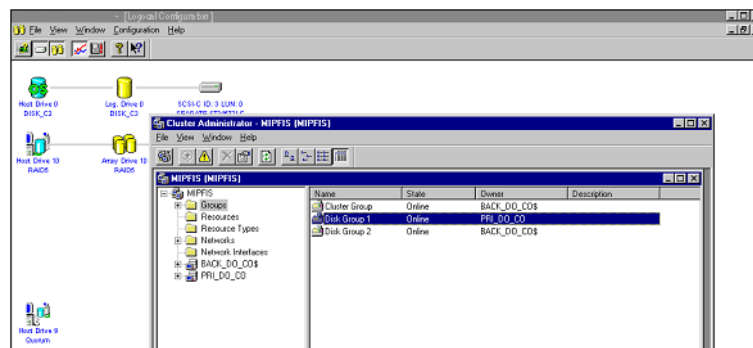
The shared host drive still belongs to this IIR controller. Now it is moved within the cluster administrator to the other node (with the other IIR controller). See the drop down menu in [Figure A-7](#).

Figure A-7. Cluster Administration



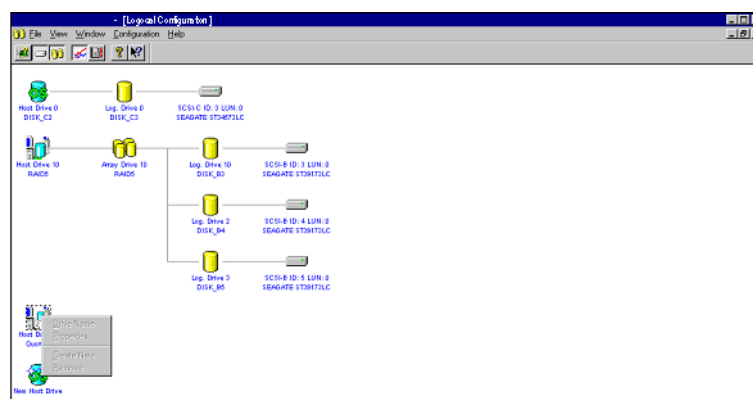
The host drive icon (bottom left corner of window) changes showing that this host drive belongs to the other node. See [Figure A-8](#).

Figure A-8. Cluster Administration



No changes or modifications can be made on this host drive. If you loaded the StorCon+ on the other node, you would see the reverse situation. The RAID 5 array drive icon would stand alone, showing that this host drive belongs to the other node, and the RAID1 host drive would be displayed with all its components, allowing configuration changes to these components.

Figure A-9. Logical Configuration



A.2 PCI Hot Plug Overview

The PCI Hot Plug (PCI HP) specification defines the requirements for adapter cards, system platforms, and system software to enable the insertion and removal of PCI adapter cards without turning off the platform or rebooting the operating system. The process may include stopping a portion of the software or controlling the power cycle of a portion of the hardware such as, in this case, a PCI slot. This industry standard offers customers higher system availability by helping to eliminate both planned and unplanned downtimes.

PCI HP requires network operating system (NOS) and PCI adapter driver support. PCI HP is different from other types of hot swapable devices since such devices (like a fan or power supply) do not require the cooperation, or knowledge, of the NOS or any specialized driver in order to perform an online replacement.

A PCI Hot Plug system requires a hot plug platform, a hot plug OS, and hot plug adapter drivers. A system can include any combination of hot plug and conventional versions of each of these components, including a mix of both hot plug and conventional adapter drivers. However, a particular adapter can be hot plugged only if all three components for that adapter support hot plug operation.

There are two basic functions of PCI Hot Plug:

Hot Insertion

The Insertion of a device into a powered-down PCI HP slot and power up of that slot once device is inserted. Assumes that driver for (PnP) device being inserted does not require reboot or driver is already loaded.

Hot Removal

Removal of a device by first powering down the HP PCI slot on which the device is inserted then physically removing the device for the HP PCI slot. Surprise Removal, the removal of the card while the slot still powered, is not supported.

PCI Hot Plug enables the features of replacement/repair (Hot Replacement), addition (Hot Addition), adapter update, and deletion (Hot Deletion) of PCI adapters. Hot Replacement consists of replacing an unusable adapter in a system utilizing, in sequence, the *Hot Removal* followed by the *Hot Insertion* functions of PCI Hot Plug. Hot Addition consists of adding a completely new device to the system utilizing the *Hot Insertion* function of PCI Hot Plug. Hot Deletion consists of removing (but not replacing) an existing adapter in a system utilizing the *Hot Removal* function of PCI Hot Plug.

Warning: Prior to initiating the removal of the adapter via PCI Hot Plug, the user is responsible for closing all applications that communicate to the adapter and for verifying that there is no I/O activity to the IIR controller.

Refer to the appropriate Hardware Guide to determine the PCI Hot Plug features implemented on the IIR controller.

Integrated support for PCI Hot Plug can be found with the following operating systems:

- Novell NetWare 4.11, 5.x and 6.x
- SCO UnixWare 7.x and 8.0
- Microsoft 2000

Windows NT 4.0 is capable of supporting Hot Replacement but only with special drivers.

Refer to the Hardware Guide of the IIR controller to determine the specific operating systems being supported.

Advanced Features

B

B.1 Chaining

The IIR firmware supports Drive Chaining (also referred to as Disk Spanning). Drive Chaining is the process of linking several individual drives to form a large single drive. Chaining is only available after having selected two or more drives in the Storage Console or StorCon+.

Warning: Using logical drives of the type *chain* as components of array drives is not recommended.

Warning: Disk Chaining does not offer any form of data protection.

B.1.1 Configuring a Chaining Set Using StorCon

1. Select *Create New Host Drive*.
2. Select 2 or more drives.
3. Press Enter and select *Chaining*.

B.1.2 Configuring a Chaining Set Using StorCon+

1. Click on the *New host drive* icon.
2. Select the *Configuration* menu, then *Host Drive, Create New*. A new host drive window appears.
3. Select a drive(s) using <Shift> and arrow keys. *Chaining* is greyed out before selecting 2 drives and is available after selecting 2 drives.
4. Select *Chaining* and press Enter.

The system will configure the chain set that is now a logical drive.

Fibre Channel Features

C

This appendix describes Fibre Channel (FC) functionality with your IIR controller. Fibre Channel functionality does not alter the normal interaction with your RAID controller. In fact, there are no user-definable parameters specific to Fibre Channel. There are however some differences in how information about your Fibre Channel is presented. This section covers these differences.

C.1 Boot BIOS Message

During system POST, the IIR Controller BIOS check informs the user of the state of the Fibre Channel loops. In [Figure C-1](#), the screen shows that Loop A has been initiated and Loop B has not been initiated.

Note: Color was added to screen only to highlight.

This would be expected for a single loop configuration. In a dual loop configuration, this would indicate that action is required to resolve the problem with the failed loop.

Figure C-1. Fibre Channel Boot BIOS Screen

```

PCI          Disk Array Controller BIOS                      Version
Copyright © 1991-2001 by Intel Corporation (R)
All rights reserved!
BIOS at 0x000CB000-0x---D07FF
1 Controller(s) found, Selftests OK, scanning SCSI Bus ...
[PCI 1/9] DPMEM (M) at 0xFC8F0000-0xFC8F3FFF, INT A - IRQ 11
[PCI 1/9] SRCFC22C - HWLO - 128 MB SDRAM/ECC - 2048kB Flash-RAM
[PCI 1/9] SN 12X3Y456 - Firmware-FW-Version 2.34.00.0000 - May 31 2002.
[PCI 1/9] SCSI-A ID:6 LIN:0 - ESG-SHW SCA HSBP M16
[PCI 1/9] Initializing Fibre Channel Link:
[PCI 1/9] FCAL-A Fibre Channel Private Loop initialized
[PCI 1/9] FCAL-B Fibre Channel Private Loop could not be initialized
[PCI 1/9] ECC support enabled
[PCI 1/9] SCSI-A ID:0 LUN:0 - SEAGATE ST336705LC 160MB/s
[PCI 1/9] FCAL-A ID:1 LUN:0 - SEAGATE ST318452FC
[PCI 1/9] FCAL-A ID:2 LUN:0 - SEAGATE ST318452FC
[PCI 1/9] FCAL-A ID:3 LUN:0 - SEAGATE ST318452FC
[PCI 1/9] FCAL-A ID:4 LUN:0 - SEAGATE ST318452FC
[PCI 1/9] Logical Drive 0 installed as Host Drive

>>> Press <Ctrl><G> to enter ICP RAID Console <<<

```

C.2 Physical Device Information

This section describes screen information specific to an FC-enabled IIR controller.

C.2.1 Physical Device Configuration Screen

In addition to the standard information provided in the “Configure Physical Device” menu option (see [Section 10.5.2](#)), information also displays about FC I/O channels and available FC devices. See [Figure C-2](#) for details.

Note: In a dual-channel configuration, shared FC devices are denoted by “*” in the channel information column.

Figure C-2. Physical Device Configuration Screen

Select Physical Drive						
Chn	ID	LUN	Vendor	Product	Attr	Cap(MB) Drive
SCSI-A	6	0	ESG-SHU	SCA HSBP M16		
SCSI-A	0	0 i	SEAGATE	ST336705LC	RW	34971
SCSI-A	1	0 i	SEAGATE	ST336705LC	RW	34700 Drive 0
SCSI-A	2	0 i	SEAGATE	ST336705LC	RW	34971
SCSI-A	7	0	SCSI I/O Processor			
FCAL-*	1	0 i	SEAGATE	ST318452FC	RW	17469 Drive 4
FCAL-*	2	0 i	SEAGATE	ST318452FC	RW	17469 Drive 1
FCAL-*	3	0 i	SEAGATE	ST318452FC	RW	17469 Drive 2
FCAL-*	4	0 i	SEAGATE	ST318452FC	RW	17469 Drive 3
FCAL-A	126	0	FC I/O Processor			
FCAL-B	126	0	FC I/O Processor			
Rescan for new device						
Plug in new disk (Hot Plug)						
F4: Extended Information, F5: Identify Drive, F8: Repair						

C.2.2 Fibre Channel Information

In the Configure Physical Devices screen (Figure C-2), note an FC I/O processor for each FC channel. Select one of these processors and press <F4> to display the screen in Figure C-3 about Fibre Channel information for that channel.

Figure C-3. Fibre Channel Information Screen

```

--- Fibre Channel Information ---
--- General Settings ---
Supported link speeds [MBaud] .... 1063, 2125
Supported media types ..... Shielded Twisted Pair
                               Multimode Optical Fiber
GLM chip name, revision ..... Agilent HDMP 2630
IO processor name, revision ..... TACHYON XL2 Rev. 2.2
Fibre Channel World Wide Name .... 20F6009062EFFFFF (hex.)
Lowest and highest ANSI version .. 4.3/4.3
Supported topologies ..... FC-AL
Supported upper level protocols .. SCSI-FCP
Min. and max. frame size [Bytes] . 256/2048
Supported service classes ..... 3

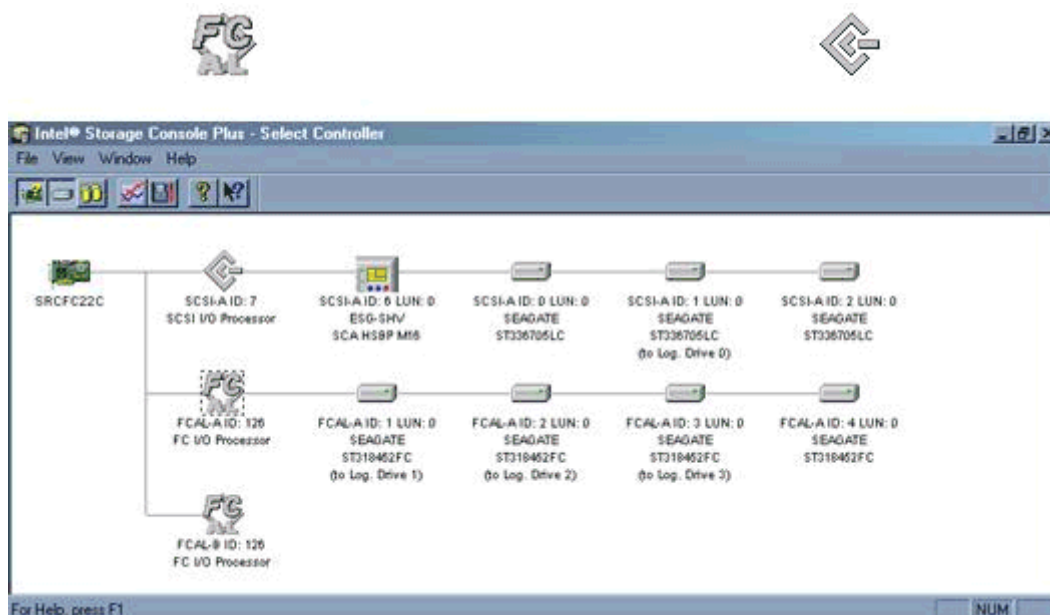
--- Current Settings ---
Current topology ..... FC-AL
FC-AL physical address ..... 125
Physical link speed [MBaud] ..... 2125
Fibre channel status ..... Ready

```

C.2.3 Using StorCon+

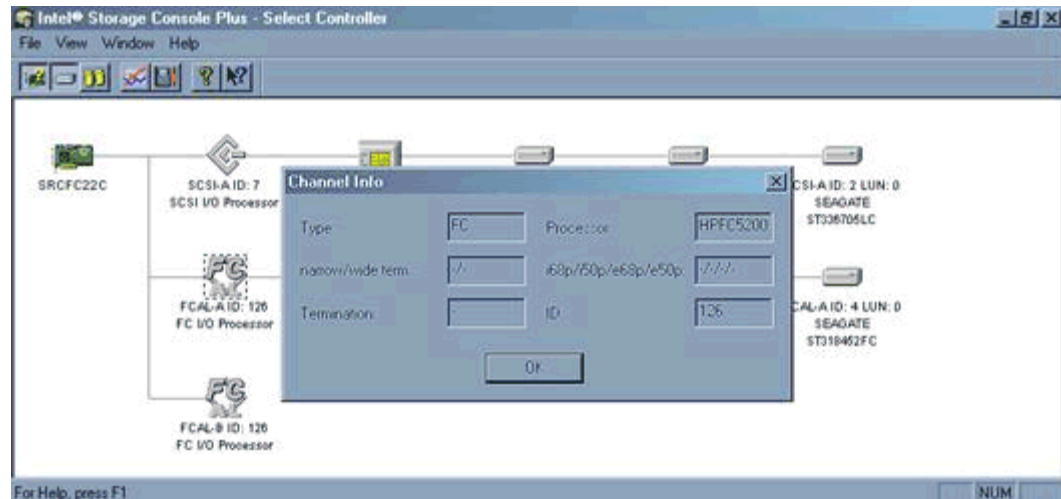
StorCon+ offers additional information about FC I/O channels and available FC devices. The first noticeable difference is in the Physical Configuration window. Note that the icons for the SCSI I/O processor (as explained in [Section 11.4.2](#)) and the FC-AL are different. See the Physical Configuration window in [Figure C-4](#) for details.

Figure C-4. StorCon+ Physical Configuration Window



Refer to [Section 11.4.2](#) for detailed information navigating the (SCSI) I/O Processors. As indicated in this section, double-clicking the (SCSI) I/O processor icon displays channel information about that processor. When doing the same on an FC I/O processor, note the only difference is the “TYPE” field changed to “FC” (see [Figure C-5](#) for details). All other parameters remain the same for FC I/O processor(s) and FC devices.

Figure C-5. StorCon+ Channel Information



C.2.4 Configuring an FC-Enabled RAID Controller for Optimal Performance

Correct configuration of your controller is crucial if attempting to attain the highest possible performance of the controllers. These are some of the areas that should be checked when considering optimal performance of your RAID controller:

- Ensure that your FC-AL loops are initialized. See the section of your FC-enabled IIR Controller’s *Hardware Guide* entitled “Configuring Single and Dual Loops” to ensure that your loop is configured correctly. Also see [Section C.1, Boot BIOS Message](#) to ensure that your loops are initialized.
- Ensure that your controller is running at a 2G Link Speed. To check, use one of these methods:
 - Enter StorCon. Select “Save Information.” Under “Controller Information,” locate the field “Link Speed [Mbaud].” This field should include “2125” if your 2G link is working correctly.
 - or
 - Verify this information in the “Fibre Channel Information” window (see [Section C.2.2](#)).
- Use a Dual-Loop configuration. See the section of your FC-enabled IIR Controller’s *Hardware Guide* entitled “FC-AL Single and Dual Loop Configurations” for details on how dual loops improve performance.
- Ensure your controller is inserted in a 64-bit/66MHz PCI slot.

- Use between 8-18 logical drives in your RAID configurations.

C.3 SES Support

This section describes how to change and verify SES status for an FC-enabled IIR controller.

C.3.1 SES Status Change

You must use StorCon X-ROM to change SES status for an FC-enabled IIR controller.

Note: You can verify SES status from StorCon or StorCon+ (see [Section C.3.2](#)).

1. From StorCon X-ROM, select the controller. The Express Setup menu opens.
2. Press <F4>. The Advanced Setup menu opens.
3. From the Advanced Setup menu, select Configure Controller.
4. From the Configure Controller menu, select Controller Settings.
5. From the Controller Settings menu, select SES Support.
6. Press <ENTER>.
7. Select “Disabled” or “Enabled.”

C.3.2 SES Verification

You can use StorCon or StorCon+ to verify SES status.

C.3.2.1. Verifying SES Status in StorCon

1. From StorCon X-ROM, select the controller. The Express Setup menu opens.
2. Press <F4>. The Advanced Setup menu opens.
3. From the Advanced Setup menu, select Configure Physical Devices.
4. From the Configure Physical Devices menu, select an FCAL hard drive.
5. Press <ENTER>. The Configure Disk menu opens.
6. Select “Enclosure State” or “Enclosure Slot Configuration.”

C.3.2.2. Verifying SES Status in StorCon+

1. From StorCon+, select the controller.
2. Open the Physical Configuration view.
3. Right-click on the FC-AL drive.
4. Select “SES: Enclosure Status” or “SES: Enclosure Configuration.”

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